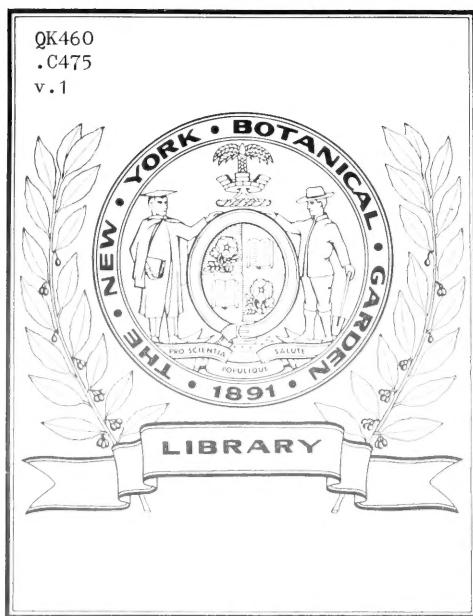




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ILLUSTRATIONS
OF THE
NEW ZEALAND FLORA.

61
EDITED BY
T. F. CHEESEMAN, F.L.S., F.Z.S.,
CURATOR OF THE AUCKLAND MUSEUM.

WITH THE ASSISTANCE OF
W. B. HEMSLEY, F.R.S.,
LATE ASSISTANT DIRECTOR OF THE ROYAL GARDENS, KEW.

THE PLATES DRAWN BY
MISS MATILDA SMITH,
OF THE ROYAL HERBARIUM, KEW.

LIBRARY
NEW YORK
BOTANICAL
GARDEN
VOL. I.

PUBLISHED UNDER THE AUTHORITY OF THE GOVERNMENT OF NEW ZEALAND.

36
WELLINGTON, N.Z.
JOHN MACKAY, GOVERNMENT PRINTER, WELLINGTON.

1914.

QK460
.C475
v.1

PREFACE.

TWELVE years ago, when the New Zealand Government was pleased to entrust me with the preparation of the "Manual of the New Zealand Flora," the first outline of the limits of the projected work provided for an atlas of plates to illustrate species described therein. It soon became obvious, however, that the attempt to publish both works simultaneously would much delay the appearance of the Manual; and it was finally decided that the publication of the plates should stand over until the more important work of providing a descriptive account of the plants of the Dominion had been completed.

After the appearance of the Manual in 1906 the proposal to provide a series of illustrations was revived, and early in 1907 I was asked by the Department of Education to furnish my views on the subject. Prior to that, however, many suggestions had been made as to the nature of the illustrations to be adopted, and it may be useful to mention the chief of these. In the first place, it was suggested that arrangements might be made for the reproduction, on a reduced scale, of the elaborate folio plates engraved to accompany the descriptions drawn up by Dr. Solander of the plants collected during Cook's first visit to New Zealand in 1769, but which were never actually published; and I understand that the Trustees of the British Museum, as custodians of the plates, were willing to grant the necessary permission. But against this proposal it was at once objected that such a series of plates would give a very incomplete representation of the flora of the Dominion, seeing that the plants collected by Cook were obtained in a few localities on the coast-line of the North Island or in the extreme north of the South Island, and did not include any examples of the mountain or alpine flora, or of the plants restricted to the southern portions of the Dominion. Furthermore, it was represented that the plates themselves, although accurate, and undoubtedly of great historic value, were of somewhat antiquated style, and were deficient in the microscopic analyses now considered essential in all really good botanical drawings. A second suggestion was that the many beautiful plates contained in Sir J. D. Hooker's "*Flora Novæ Zelandiæ*" and "*Flora Antarctica*" should be reproduced by photo-lithography, and that to those might be added numerous plates of New Zealand plants contained in the "*Botanical Magazine*" and "*Icones Plantarum*." While no objection could be urged against the style and character of these plates, there still remained the fact that they would not constitute an all-round representation of the plants of the Dominion, seeing that they also contained very few examples of the peculiar montane and alpine flora, and that even many important lowland genera were not adequately represented, as, for instance, the genus *Coprosma*. A third view, which I believe was held by most New Zealand botanists, was that the plates should be new ones, or, in other words, should be specially drawn for the work.

My own views on the subject, as presented to the Education Department, and, with some slight modification, finally accepted by it, may be given here, as they explain the reasons for the plan of the work, the selection and style of the plates, and the character of the letterpress. I

took it for granted that the Government had no desire to trouble with the preparation of plates of a character capable of being undertaken by an enterprising publisher, and treated in a sufficiently popular manner to command a remunerative sale, or, in other words, that there was no intention of producing a series of drawings selected mainly on account of the beauty and attractiveness of the plants portrayed. I assumed that the true object of the work was to issue plates of an educational character, so selected as to present an accurate and comprehensive idea of the main features of the flora, and so designed and executed as to be of real use in the study and identification of the plants of the Dominion. Furthermore, as the work would be issued under the auspices of the Government of the Dominion, it was felt that there would be no necessity to sacrifice scientific accuracy and excellence of design for the sake of cheap production.

Starting with these considerations as a guide, the first point to determine was the number of plates required to properly illustrate the flora. A complete set of illustrations, similar, for instance, to those of Sowerby's "English Botany," where every known species is figured, was obviously out of the question. The number of flowering-plants and ferns at present known in New Zealand is over sixteen hundred. To figure the whole of these would be the work of very many years, and would cost many thousands of pounds. All that could be aimed at, and all that was really necessary, was a selection of about two hundred and fifty plates. This number permits all the important genera to be represented, and gives a sufficient idea of the scope and character of the flora.

With respect to the important question as to whether the illustrations should be original—that is, prepared expressly for the work—or whether they should be reproductions of existing plates, I have already mentioned the chief objection to the use of the latter class in the fact that it is not sufficiently varied to give an adequate representation of the whole of the flora. A considerable proportion of the plates could not be used; many new plates would be required to fill up the blanks; and the two classes of plates—old and new—would not form a harmonious whole. Further, it appeared to me that a series of botanical drawings prepared under the auspices and at the expense of the Government of the Dominion should add to our knowledge of the flora, or, in other words, should be something more than reproductions of plates issued fifty or sixty years ago, or even more, and which had fully served their purpose. I had therefore no hesitation in advising that the plates should be specially drawn for the work.

The number of plates and their character having been determined upon in accordance with the above recommendations, the next point to attend to was whom to appoint to draw the plates. It would have been a satisfaction, both to the Government and myself, if there had been some competent botanical artist resident in New Zealand to whom the work could have been entrusted, but no person possessing the necessary qualifications could be found. Nor is this at all surprising, for botanical drawing, together with a knowledge of how to prepare the microscopical analyses required, is an art in itself; and the number of good botanical artists in England even is small. I was therefore compelled to seek for a competent person outside the Dominion, and after some negotiation it was decided to offer the work to Miss Matilda Smith, of the Royal Herbarium, Kew. Miss Smith's capabilities are widely known among botanists; but as a matter of information to the general reader it is well to say that since 1880 she has been sole artist for the "Botanical Magazine" and "Icones Plantarum"; while among the numerous works illustrated by her it will be sufficient to mention the "Botany of the Challenger Expedition," Balfour's

"Flora of Socotra," Collett's "Flora Simlensis," and Aitchinson's "Botany of Afghanistan." Altogether, nearly five thousand of her drawings have actually appeared in various well-known publications. I think that all capable judges will agree with me in saying that the plates contained in these volumes will enhance her already well-earned reputation. The position of lithographer was accepted by Mr. J. N. Fitch, widely known for his excellent lithographic work in all branches of natural science. The actual printing of the plates was entrusted to West, Newman, and Co.

As it was obviously impossible, except in a few special cases, to send proofs of the artist's drawings or of the lithographer's work backwards and forwards between England and New Zealand, it became necessary to select some experienced botanist resident in England to act as supervisor. It must be regarded as a fortunate circumstance that the services of Mr. W. B. Hemsley, F.R.S., late Assistant Director of the Royal Gardens, Kew, were available for the purpose, for Mr. Hemsley's wide reputation as a botanist, and his long experience in editing and supervising the publication of botanical works, gave his assistance a special value. His duties were to approve the artist's sketch, to control the dissections and to indicate their arrangement on the plate, to pass the finished drawings, to receive proofs of the lithographs, and finally to pass for printing. In addition to the above, Mr. Hemsley was kind enough to make several comparisons with the specimens preserved in the Kew Herbarium with the object of establishing the identity of the material figured with the actual type of the species.

My own share of the work may be briefly described as follows: To prepare the general plan and to select the plants to be figured; to obtain and forward a full series of specimens of each species for the use of the artist, including in this material flowers and fruits in spirits, photographs, notes, and all information required to give a proper idea of the plants to be drawn; to take care that each species was accurately labelled and its position in the series of plates indicated; to conduct the correspondence with the artist and supervisor, and to advise them on all matters connected with the progress of the work; to write the printed matter accompanying the plates, and to prepare all other letterpress; and finally to examine and pass all printers' proofs, and generally to see the work through the press.

In selecting the plants to be figured I have endeavoured to present, as far as possible, a complete view of the main features of the flora. I think I can say that no important genus or group of plants is without proper representation; and, further, that the species are so selected as to include examples from all parts of the Dominion, from the Kermadec Islands in the north to the Auckland and Campbell Islands in the south. The alpine flora has received full treatment, particularly in genera like *Gentiana*, *Myosotis*, *Aciphylla*, and others, which have hitherto received little attention in the way of illustrations. Special attention has been paid to the endemic genera; and I have also illustrated no small number of plants which possess special interest, either on account of their economic value, or from biological or morphological reasons, or from their peculiar geographical distribution. On the other hand, I have not thought it necessary, except in a few special instances, to figure plants found in other countries as well as New Zealand.

As the plates are intended to illustrate the "Manual of the New Zealand Flora," which contains full descriptions of all the species figured, it was obviously unnecessary to encumber the letterpress with technical descriptions which had already appeared in that book. As a rule I have

therefore purposely avoided all matter published in the Manual. In drawing up the letterpress I have thought it desirable to mention the facts connected with the first discovery of the plant under treatment. Not only is this of value in tracing the history and identity of the type, but it will also serve to draw attention to those pioneers of botanical exploration to whom our first knowledge of the flora is due, and to whom sufficient credit has never been given. In these days, when it is an easy matter to travel the whole length and breadth of the Dominion, we are apt to lose sight of the fact that expeditions like that of the two Cunninghams in 1826-38; of Bidwill and Dieffenbach in 1839-41; of Colenso from 1834 onwards; and even the earlier explorations of Sir Julius von Haast, Sir James Hector, and others into the recesses of the mountains of the South Island, were all accompanied by much privation and great personal danger. Allan Cunningham's premature death is attributed by his biographer to the effects of "twenty-five years of unwearied exertion and laborious travel"; and we all know that one of the foremost of the early botanists, Dr. A. Sinclair, lost his life while exploring the alpine vegetation of the South Island.

I have thought it advisable to indicate the distribution within the Dominion of each of the species figured, so far as it is known at present; and in all non-endemic genera I have also attempted to point out the geographical range of each genus outside New Zealand. I have also alluded to any economic value which the plant may possess, and I have endeavoured to mention any uses to which the Maoris may have applied it, or any traditions which they may have had concerning it. Lastly, I have attempted to describe any facts of scientific interest, whether ecological, morphological, or systematic, which appeared to concern the plants under consideration. And as the letterpress is not intended to form a series of monographs of the species figured, but rather to act an indication of the salient points in their history, I have endeavoured to avoid all unnecessary detail or useless verbiage.

The number of New Zealand plants that have been figured in other publications prior to the appearance of this work is far larger than is commonly supposed, and a list of them, even if not absolutely complete, cannot fail to be of use to the student. I have therefore prepared as full a catalogue as the material at my disposal will permit. It includes references to approximately 1,640 drawings of 947 species. Although a proportion of these are of old date, and are more or less imperfectly executed (as, for instance, Forster's plates in his "*Characteres Generum*"), they usually have some historical or bibliographical value, especially in those cases where they represent the type of the species. The sumptuous folio volumes prepared to illustrate the French voyages of discovery, especially those relating to the "*Voyage of the Astrolabe*" and the subsequently published "*Voyage au Pole Sud*," together with Raoul's "*Choix des Plantes*," contain a large number of beautifully executed plates, some of them being exquisite works of art. But by far the most valuable illustrations of New Zealand plants yet issued are those prepared under the auspices of the two Hookers. We have to thank Sir W. J. Hooker for many plates in the earlier volumes of the "*Icones Plantarum*," the "*Botanical Magazine*," and the "*London Journal of Botany*," to say nothing of the numerous drawings of ferns given in the "*Species Filicum*," "*Exotic Ferns*," &c. The debt due to his son and successor, Sir J. D. Hooker, is better known, for most colonial botanists are acquainted with the beautiful illustrations contained in the six volumes of the "*Flora Novæ Zelandiæ*," the "*Flora Antartica*," and the "*Flora of Tasmania*." The attempts made

by the Hookers to form a pictorial representation of the flora of New Zealand will perhaps be still better appreciated when it is stated that no less than 350 plates have been published through their efforts, and that without including numerous illustrations of the lower cryptogams.

As in the case of the "Manual of the New Zealand Flora," I have to tender my most sincere thanks to numerous friends and correspondents for assistance in the preparation of the work. More especially am I grateful to those who, at considerable trouble to themselves, have forwarded much valuable material for the use of the artist; for although, in the majority of instances, I have been able to personally obtain the specimens required, there remained several species with local or restricted habitats where this could not be done. In all such cases I have thought it only right to quote the name of the contributor in the explanation of the plate. Where no collector is mentioned it is implied that the material was collected by myself.

Among those contributors to whom special reference should be made I desire to mention first of all the name of the late Mr. H. J. Matthews. At the time of the inception of this work Mr. Matthews held the post of Chief Forester, and I am greatly indebted to him for numerous excellent specimens and many beautiful photographs of plants intended to be figured. Mr. Matthews had sketched out an extensive plan of future assistance, but his premature death cut short all such intentions. I can only express my great regret that he did not live to see the completion of a work in which he took so great an interest.

Mr. F. G. Gibbs, of Nelson, is another gentleman who has rendered important assistance by forwarding a large amount of excellent material. The plates of *Panax lineare*, *Gentiana gracilifolia*, *Myosotis Monroi*, *Veronica Gibbsii*, *Pimelea Suteri*, and several others are based entirely on specimens supplied by him. In many other ways I am indebted to Mr. Gibbs for frequent help in botanical matters, and I am glad to avail myself of this opportunity of acknowledging my obligations.

So few of the peculiar plants of the Chatham Islands have been figured in botanical works that I have pleasure in drawing attention to the welcome assistance rendered by Mr. F. A. D. Cox, for many years resident in the group, and long known for his researches into its vegetation. Through his efforts I have been able to give plates of *Coxella Dieffenbachii*, *Pseudopanax chathamicum*, *Olearia semidentata* and *O. chathamica*, and *Gentiana chathamica*. My best thanks are due to him for such a valuable contribution.

The large collections made by Mr. W. Townson on the mountain-ranges in the vicinity of Westport and in north-west Nelson generally, and which were placed at my disposal during the preparation of the Manual, have enabled me to figure some of the more local plants of the district, such as *Drimys Traversii* and *Metrosideros Parkinsonii*; and also a fair proportion of the new species discovered by him, such as *Townsonia deflexa*, *Aciphylla Townsoni*, *Gentiana Townsoni*, and others. My renewed thanks are due to him for his continued assistance.

Among other contributors who have rendered material help I desire to mention the late Mr. R. H. Matthews and Mr. H. Carse for assistance with the plants of the extreme north; Mr. B. C. Aston, to whom I am indebted for the specimens upon which the plates of *Ranunculus Aucklandicus* and *Pleurophyllum Hookeri* are based; Mr. H. Hill, for the specimens figured of the remarkable *Bagnisia Hillii*; Miss Shakspear; Bishop Williams; Mr. Petrie; Dr. Cockayne; Mr. J. W. Brame; Mr. J. Hall; Mr. A. Gordon; and others.

In this place I desire to draw attention to the very important aid granted by Sir David Prain, the Director of the Royal Gardens, Kew. By his instructions Miss Smith was allowed special facilities for drawing the plates at Kew; the correspondence between Mr. Hemsley and myself was treated as official; the parcels of specimens for the artist were received and cared for by the assistants in the Kew Herbarium, and when finished with were packed and returned to me. Such assistance has been of great service, and must not pass without due notice and acknowledgment.

I have already stated that the arrangements for the preparation of the work and my appointment as editor were made on behalf of the Government by the Department of Education. I now desire to thank the Department for its readiness at all times to discuss with me any matters relating to the progress of the work, and for the courteous manner in which any suggestions made by myself have been received and considered. In this connection it is due to mention the names of the Hon. G. Fowlds, who was Minister of Education when the work was first authorized; and the Hon. J. Allen, who occupies the position at the present time. As for the permanent officers of the Department, my warmest thanks are due to Mr. G. Hogben, the Inspector-General of Schools; Sir E. Osborne Gibbes, the Secretary of Education; and Mr. W. E. Spencer, who has had much to do with the correspondence concerning the work.

In conclusion, it only remains for me to call attention to the excellent manner in which the plates have been printed by West, Newman, and Co., and for the very great care and attention which the Government Printer has given to the passage of the work through the press.

Auckland, July, 1914.

SYSTEMATIC INDEX TO THE PLATES OF VOLUME I.

RANUNCULACEÆ.

1. *Clematis indivisa*, *Willd.*
2. *Clematis parviflora*, *A. Cunn.*
3. *Ranunculus Lyallii*, *Hook. f.*
4. *Ranunculus nivicola*, *Hook.*
5. *Ranunculus Enysii*, *T. Kirk.*
6. *Ranunculus sericophyllus*, *Hook. f.*
7. *Ranunculus aucklandicus*, *A. Gray.*

MAGNOLIACEÆ.

8. *Drimys Traversii*, *T. Kirk.*

CRUCIFERÆ.

9. *Nasturtium latesiliqua*, *Cheesem.*
10. *Lepidium oleraceum*, *Forst.*
11. *Lepidium sisymbrioides*, *Hook. f.*
12. *Notothlaspi australe*, *Hook. f.*

VIOLACEÆ.

13. *Melicytus ramiflorus*, *Forst.*
14. *Hymenanthera novæ-zelandiæ*, *Hemsl.*

PITTOSPORACEÆ.

15. *Pittosporum ellipticum*, *T. Kirk.*
16. *Pittosporum crassifolium*, *A. Cunn.*
17. *Pittosporum Kirkii*, *Hook. f.*

CARYOPHYLLACEÆ.

18. *Stellaria Roughii*, *Hook. f.*
19. *Stellaria gracilentia*, *Hook. f.*
20. { *Colobanthus acicularis*, *Hook. f.*
Colobanthus canaliculatus, *T. Kirk.*

MALVACEÆ.

21. *Plagianthus cymosus*, *T. Kirk.*

TILIACEÆ.

22. *Entelea arborescens*, *R. Br.*
23. *Aristotelia racemosa*, *Hook. f.*
24. *Elæocarpus dentatus*, *Vahl.*

GERANIACEÆ.

25. *Geranium Traversii*, *Hook. f.*

RUTACEÆ.

26. *Phebalium nudum*, *Hook.*
27. *Melicope ternata*, *Forst.*

RHAMNACEÆ.

28. *Pomaderris Edgerleyi*, *Hook. f.*

ANACARDIACEÆ.

29. *Corynocarpus levigata*, *Forst.*

CORIARIACEÆ.

30. *Coriaria ruscifolia*, *Linn.*

LEGUMINOSÆ.

31. *Corallospartium crassicaule*, *Armstr.*
- 31A. *Chordospartium Stevensoni*, *Cheesem.*
32. *Carmichaelia Williamsii*, *T. Kirk.*
33. *Carmichaelia grandiflora*, *Hook. f.*
34. *Carmichaelia odorata*, *Col.*
35. *Carmichaelia gracilis*, *Armstr.*
36. *Notospartium Carmichaeliæ*, *Hook. f.*

ROSACEÆ.

37. *Rubus parvus*, *Buch.*
38. *Geum uniflorum*, *Buch.*
39. *Acæna novæ-zelandiæ*, *T. Kirk.*

SAXIFRAGACEÆ.

40. *Ixerba brexioides*, *A. Cunn.*
41. *Carpodetus serratus*, *Forst.*
42. *Ackama roseifolia*, *A. Cunn.*
43. *Weinmannia racemosa*, *Linn. f.*

CRASSULACEÆ.

44. { *Tillæa moschata*, *D.C.*
Tillæa Sieberiana, *Schultz.*

DROSERACEÆ.

45. { *Drosera Arcturi*, *Hook.*
Drosera pygmæa, *D.C.*

HALORAGACEÆ.

46. *Myriophyllum robustum*, *Hook. f.*

MYRTACEÆ.

47. *Leptospermum Sinclairii*, *T. Kirk.*
48. *Metrosideros diffusa*, *Smith.*
49. *Metrosideros Parkinsonii*, *Buch.*
50. *Metrosideros albiflora*, *Soland.*

ONAGRACEÆ.

51. *Epilobium pallidiflorum*, *Solapd.*
52. *Epilobium rotundifolium*, *Forst.*
53. *Epilobium brevipes*, *Hook. f.*
54. *Epilobium melanocaulon*, *Hook.*
55. *Epilobium glabellum*, *Forst.*
56. *Fuchsia procumbens*, *R. Cann.*

FICOIDEÆ.

57. *Tetragonia trigyna*, *Banks & Sol.*

UMBELLIFERÆ.

58. *Hydrocotyle elongata*, *A. Cann.*
59. *Azorella Haastii*, *Benth. & Hook. f.*
60. *Azorella Roughii*, *Benth. & Hook. f.*
61. *Aciphylla Hookeri*, *T. Kirk.*
62. *Aciphylla Townsonii*, *Cheesem.*
63. *Aciphylla Monroi*, *Hook. f.*
64. *Coxella Dieffenbachii*, *Cheesem.*
65. *Ligusticum Haastii*, *F. Moell.*
66. *Ligusticum carnosulum*, *Hook. f.*
67. *Ligusticum piliferum*, *Hook. f.*
68. *Angelica Gingidium*, *Hook. f.*
69. *Angelica rosefolia*, *Hook.*

ARALIACEÆ.

70. *Stilbocarpa Lyallii*, *T. Kirk.*
71. *Panax lineare*, *Hook.*
72. *Panax anomalum*, *Hook.*
73. *Meryta Sinclairii*, *Scem.*
74. *Pseudopanax discolor*, *Harms.*
75. *Pseudopanax chathamicum*, *T. Kirk.*

CORNACEÆ.

76. *Corokia buddleoides*, *A. Cann.*
77. *Griselinia lucida*, *Forst.*

CAPRIFOLIACEÆ.

78. *Alseuosmia macrophylla*, *A. Cann.*

RUBIACEÆ.

79. *Coprosma lucida*, *Forst.*
80. *Coprosma serrulata*, *Hook. f.*
81. *Coprosma areolata*, *Cheesem.*
82. *Coprosma rhamnoides*, *A. Cann.*
83. *Coprosma fatidissima*, *Forst.*
84. *Coprosma acerosa*, *A. Cann.*

COMPOSITÆ.

85. *Olearia insignis*, *Hook. f.*
86. *Olearia semidentata*, *Decne.*
87. *Olearia chathamica*, *T. Kirk.*
88. *Olearia nitida*, *Hook. f.*
89. *Olearia lacunosa*, *Hook. f.*
90. *Olearia moschata*, *Hook. f.*
91. *Olearia virgata*, *Hook. f.*
92. *Pleurophyllum Hookeri*, *Buch.*
93. *Celmisia lateralis*, *Buch.*
94. *Celmisia Haastii*, *Hook. f.*
95. *Celmisia Traversii*, *Hook. f.*
96. *Celmisia petiolata*, *Hook. f.*
97. *Celmisia viscosa*, *Hook. f.*
98. *Celmisia Hectori*, *Hook. f.*
99. *Celmisia glandulosa*, *Hook. f.*
100. *Haastia Sinclairii*, *Hook. f.*
101. *Gnaphalium subrigidum*, *Col.*
102. *Raoulia Monroi*, *Hook. f.*
103. *Raoulia subsericea*, *Hook. f.*
104. *Raoulia eximia*, *Hook. f.*
105. *Raoulia Hectori*, *Hook. f.*
106. *Raoulia Petriensis*, *T. Kirk.*
107. *Helichrysum grandiceps*, *Hook. f.*
108. *Cotula atrata*, *Hook. f.*
109. *Cassinia amona*, *Cheesem.*
110. *Cotula pyrethrifolia*, *Hook. f.*
111. *Abrotanella linearis*, *Berggr.*
112. *Abrotanella pusilla*, *Hook. f.*
113. *Erechtites glabrescens*, *T. Kirk.*
114. *Senecio Lyallii*, *Hook. f.*
115. *Senecio Hectori*, *Buch.*
116. *Senecio cassinioides*, *Hook. f.*
117. *Senecio Bidwillii*, *Hook. f.*
118. *Senecio geminatus*, *T. Kirk.*
119. *Sonchus grandifolius*, *T. Kirk.*

STYLIDIACEÆ.

117. *Forstera tenella*, *Hook. f.*

GOODENIACEÆ.

118. *Scævola gracilis*, *Hook. f.*

CAMPANULACEÆ.

119. *Pratia physaloides*, *Hemsl.*
120. *Pratia macrodon*, *Hook. f.*
121. *Lobelia Roughii*, *Hook. f.*
122. *Wahlenbergia saxicola*, *A. D.C.*

SYSTEMATIC INDEX TO THE PLATES OF VOLUME II.

ERICACEÆ.

122. *Gaultheria perplexa*, *T. Kirk*.
123. *Gaultheria oppositifolia*, *Hook. f.*

EPACRIDACEÆ.

124. *Cyathodes acerosa*, *R. Br.*
125. *Cyathodes Colensoi*, *Hook. f.*
126. *Leucopogon fasciculatus*, *A. Rich.*
127. *Epacris alpina*, *Hook. f.*
128. *Archeria racemosa*, *Hook. f.*
129. *Dracophyllum latifolium*, *A. Cunn.*
130. *Dracophyllum Townsoni*, *Cheesem.*
131. *Dracophyllum recurvum*, *Hook. f.*
132. *Dracophyllum subulatum*, *Hook. f.*

SAPOTACEÆ.

133. *Sideroxylon costatum*, *F. Muell.*

OLEACEÆ.

134. *Olea lanceolata*, *Hook. f.*

APOCYNACEÆ.

135. *Parsonsia heterophylla*, *A. Cunn.*

LOGANIACEÆ.

136. *Geniostoma ligustrifolium*, *A. Cunn.*

GENTIANACEÆ.

137. *Gentiana gracifolia*, *Cheesem.*
138. *Gentiana chathamica*, *Cheesem.*
139. *Gentiana Townsoni*, *Cheesem.*
140. *Gentiana bellidifolia*, *Hook. f.*
141. *Gentiana Spenceri*, *T. Kirk.*

BORAGINACEÆ.

142. *Myosotis Forsteri*, *Lehm.*
143. *Myosotis explanata*, *Cheesem.*
144. *Myosotis Monroi*, *Cheesem.*
145. *Myosotis concinna*, *Cheesem.*
146. *Myosotidium nobile*, *Hook.*

SCROPHULARIACEÆ.

147. *Calceolaria Sinclairii*, *Hook. f.*
148. *Veronica divergens*, *Cheesem.*
149. *Veronica leiophylla*, *Cheesem.*
150. *Veronica rigidula*, *Cheesem.*
151. *Veronica Matthewsii*, *Cheesem.*
152. *Veronica Gibbsii*, *T. Kirk.*
153. *Veronica tetragona*, *Hook.*
154. *Veronica cupressoides*, *Hook. f.*
155. *Veronica epacridea*, *Hook. f.*
156. *Veronica macrantha*, *Hook. f.*
157. *Veronica Bidwillii*, *Hook. f.*
158. *Ourisia sessilifolia*, *Hook. f.*

LENTIBULARIACEÆ.

159. { *Utricularia novæ-zelandiæ*, *Hook. f.*
 { *Utricularia delicatula*, *Cheesem.*

GESNERACEÆ.

160. *Rhabdothamnus Solandri*, *A. Cunn.*

VERBENACEÆ.

161. *Vitex lucens*, *T. Kirk.*

LABIATÆ.

162. *Scutellaria novæ-zelandiæ*, *Hook. f.*

PLANTAGINACEÆ.

163. *Plantago Raoulii*, *Decne.*

CHENOPODIACEÆ.

164. *Chenopodium triandrum*, *Forst.*

POLYGONACEÆ.

165. *Muehlenbeckia axillaris*, *Walp.*

CHLORANTHACEÆ.

166. *Ascarina lucida*, *Hook. f.*

MONIMIACEÆ.

167. *Hedycarya arborea*, *Forst.*

LAURACEÆ.

168. *Beilschmiedia Tarairi*, *Benth. & Hook. f.*
169. *Litsæa calicaris*, *Benth. & Hook. f.*

PROTEACEÆ.

170. *Persoonia Toru*, *A. Cunn.*
171. *Knightsia excelsa*, *R. Br.*

THYMELÆACEÆ.

172. *Pimelea longifolia*, *Banks & Sol.*
173. *Pimelea buxifolia*, *Hook. f.*
174. *Pimelea arenaria*, *A. Cunn.*
175. *Pimelea Suteri*, *T. Kirk.*

LORANTHACEÆ.

176. *Elytranthe Adamsii*, *Engl.*

SANTALACEÆ.

177. *Fusanus Cunninghamii*, *Hook. f.*

BALANOPHORACEÆ.

178. *Dactylanthus Taylora*, *Hook. f.*

EUPHORBIACEÆ.

179. *Homalanthus polyandrus*, *Cheesem.*

URTICACEÆ.

180. *Paratrophis heterophylla*, *Blume*.
181. *Bœhmeria dealbata*, *Cheesem.*

CUPULIFERÆ.

182. *Fagus apiculata*, *Col.*
183. *Fagus cliffortioides*, *Hook. f.*

CONIFERÆ.

184. *Agathis australis*, *Stend.*

TAXACEÆ.

185. *Podocarpus Totara*, *D. Don*.
186. *Podocarpus nivalis*, *Hook.*
187. *Dacrydium Bidwillii*, *Hook. f.*
188. *Dacrydium intermedium*, *T. Kirk.*
189. *Dacrydium laxifolium*, *Hook. f.*
190. *Phyllocladus trichomanoides*, *D. Don.*

BURMANNIACEÆ.

191. *Bagnisia Hillii*, *Cheesem.*

ORCHIDACEÆ.

191. *Bulbophyllum tuberculatum*, *Col.*
192. { *Thelymitra longifolia*, *Forst.*
 Thelymitra pulchella, *Hook. f.*
193. { *Thelymitra uniflora*, *Hook. f.*
 Prasophyllum Colensoi, *Hook. f.*
194. { *Prasophyllum pumilum*, *Hook. f.*
 Pterostylis trullifolia, *Hook. f.*
195. *Pterostylis Banksii*, *R. Br.*
196. *Pterostylis foliata*, *Hook. f.*
197. { *Lyperanthus antarcticus*, *Hook. f.*
 Caladenia bifolia, *Hook. f.*
198. { *Chiloglottis cornuta*, *Hook. f.*
 Townsonia deflexa, *Cheesem.*
199. { *Corysanthes Matthewsii*, *Cheesem.*
 Corysanthes oblonga, *Hook. f.*

LILIACEÆ.

200. *Rhipogonum scandens*, *Forst.*
201. *Luzuriaga marginata*, *Benth. & Hook. f.*
202. *Bulbinella Hookeri*, *Benth. & Hook. f.*

JUNCACEÆ.

203. *Rostkovia gracilis*, *Hook. f.*
204. { *Luzula Colensoi*, *Hook. f.*
 Luzula Cheesemanii, *Buchen.*

SPARGANIACEÆ.

205. *Sparganium antipodum*, *Gracb.*

NAIADACEÆ.

206. *Potamogeton Cheesemanii*, *A. Benn.*
207. *Potamogeton ochreateus*, *Raoul.*

RESTIACEÆ.

208. *Lepyrodia Traversii*, *F. Muell.*

CYPERACEÆ.

209. *Schœnus Carsei*, *Cheesem.*
210. *Cladium complanatum*, *Berggr.*
211. *Cladium Sinclairii*, *Hook. f.*
212. *Gahnia procera*, *Forst.*
213. *Uncinia cœspitosa*, *Boott.*
214. *Carex trachycarpa*, *Cheesem.*
215. *Carex Raoulii*, *Boott.*
216. *Carex decurtata*, *Cheesem.*
217. *Carex litorosa*, *Bailey.*

GRAMINEÆ.

218. *Imperata Cheesemanii*, *Hack.*
219. *Ehrharta Colensoi*, *Hook. f.*
220. *Hierochloa Fraseri*, *Hook. f.*
221. *Simplicia laxa*, *T. Kirk.*
222. *Agrostis Dyeri*, *Petrie.*
223. *Deyeuxia Billardieri*, *Kenth.*
224. *Deschampsia tenella*, *Petrie.*
225. *Trisetum Youngii*, *Hook. f.*
226. *Danthonia Raoulii*, *Stend.*
227. *Danthonia australis*, *Buch.*
228. *Koeleria Kurtzii*, *Hack.*
229. *Poa polyphylla*, *Hack.*
230. *Poa dipsacea*, *Petrie.*
231. *Poa Cheesemanii*, *Hack.*
232. *Poa Kirkii*, *Buch.*
233. *Festuca ovina*, *Linn. var. novæ-zelandiæ*
 Hack.
234. *Agropyrum aristatum*, *Cheesem.*

FILICES.

235. { *Hymenophyllum atrovirens*, *Col.*
 Hymenophyllum Malingii, *Mett.*
236. { *Trichomanes Lyallii*, *Hook. & Bak.*
 Trichomanes Colensoi, *Hook. f.*
237. *Davallia Tasmani*, *Cheesem.*
238. *Lindsaya viridis*, *Col.*
239. *Pteris scaberula*, *A. Rich.*
240. *Lomaria dura*, *Moore.*
241. *Lomaria nigra*, *Col.*
242. *Lomaria Fraseri*, *A. Cunn.*
243. *Asplenium Hookerianum*, *Col.*
244. *Aspidium cystostegia*, *Hook.*
245. *Nephrodium hispidum*, *Hook.*
246. *Polypodium dictyopteris*, *Mett.*
247. *Polypodium novæ-zelandiæ*, *Baker.*
248. *Lygodium articulatum*, *A. Rich.*
249. *Todea superba*, *Col.*

LYCOPODIACEÆ.

250. *Lycopodium ramulosum*, *T. Kirk.*



M. Smith del.
J.N. Fitch lith

CLEMATIS INDIVISA, Willd.

West, Newman imp.

PLATE 1.—CLEMATIS INDIVISA.

FAMILY RANUNCULACEÆ.]

[GENUS CLEMATIS, LINN.]

Clematis indivisa, Willd. *Sp. Plant.* ii, 1291; *Hook. f. Fl. Nov. Zel.* i. 6; *Cheesem. Man. N.Z. Fl.* 2.

It is somewhat remarkable that no adequate representation of this beautiful plant has appeared in any standard botanical work. The only plate I am acquainted with was given many years ago in the *Botanical Magazine* (t. 4398); but it delineates a decidedly uncommon form with lobed leaflets, and can hardly be considered as illustrating the typical state of the plant.

The first recorded specimens of *Clematis indivisa* were collected in 1773 by Forster in Queen Charlotte Sound during Cook's second voyage. The name of *C. integrifolia*, under which Forster described the plant in his "Prodromus," had already been applied to a species from the Northern Hemisphere; so that Willdenow, in the "Species Plantarum," suggested the equivalent name of *C. indivisa* in its place. Under this title it has appeared in all enumerations of New Zealand plants up to the present time. From Forster's time onwards, too, it has been observed by all botanists and explorers, and is now known to be generally distributed in lowland districts from the North Cape to Stewart Island, usually in bushy places on the outskirts of forests, &c. Its altitudinal range is from sea-level to quite 2,500 ft.

The large starlike white flowers, which are produced in immense abundance, render this an exceedingly beautiful plant, and in early spring its masses of bloom, looped from branch to branch, often whiten the trees in light forest or in tall *Leptospermum* scrub. According to Mr. Elsdon Best (*Trans. N.Z. Inst.* xl (1908) 210), the Urewera Maoris consider that *C. indivisa* is one of the three first-born children of Rehua (the star Antares), and Puanga (the star Rigel in Orion), the duty of the three children being to indicate, by means of their blossoms, the coming of the warmth of spring. The Maori name of the plant, Puawananga, has been translated, whether correctly or not I do not know, as the "sacred flower." In the Urewera district, according to Mr. Elsdon Best, the name is spelled Poananga, and is applied to the flowers alone, the stem or entire plant being called Pikiarero.

Like many other New Zealand plants, *C. indivisa* frequently has juvenile foliage very different in shape to that of the adult plant, the leaflets being narrow-linear, and sometimes lobed at the base. In an older stage the leaflets are broader, but often deeply toothed or lobulate; while when fully mature they are either quite entire or obscurely lobed or sinuate. I much regret that from want of space on the plate I have been unable to figure these curious transitional stages. The mode of climbing of this and many other species of *Clematis*, through the agency of their highly sensitive petioles, which coil around any twig with which they may be brought into contact, has often been described, and need not be further alluded to here.

C. indivisa does well in cultivation, and if planted in rich loamy soil with good drainage grows rapidly and soon covers a trellis or any other kind of support. It is also effective on rockwork, although its near ally, *C. fetida*, is perhaps better adapted for such a situation.

PLATE 1. *Clematis indivisa*, drawn from specimens collected in the vicinity of Auckland. A, male inflorescence; B, female flower. Figs. 1 and 2, stamens ($\times 5$); 3, carpel from flower (enlarged); 4, carpel from fruit (enlarged).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

CLEMATIS PARVIFLORA, A. Cunn.

PLATE 2.—CLEMATIS PARVIFLORA.

FAMILY RANUNCULACEÆ.]

[GENUS CLEMATIS, LINN.

Clematis parviflora, *A. Cunn. Precur.* n. 636; *Hook. f. Fl. Nov. Zel.* i, 7; *Cheesem. Man. N.Z.* Fl. 4.

Clematis parviflora is one of the many species first collected by the talented and enthusiastic Allan Cunningham, who in 1826 and again in 1838 explored a large part of the district lying between the Bay of Islands, Hokianga, and Whangaroa. In those days botanical exploration was a very different matter from what it is at the present time, when no part of the Dominion is far removed from settlement, roads, or even railways. The journeys made by the two Cunninghams, Bidwill, Dieffenbach, Colenso, and others involved great hardships, much fatigue, and no small amount of danger; and no estimate of the labours of these early pioneers is complete which does not take the circumstances of the times into consideration.

Cunningham gathered *C. parviflora* at Whangaroa in 1826, finding it in "thickets on the skirts of forests," and published it in his "Precursor," issued during the years 1836-39. Soon afterwards it was collected in various localities in the northern portion of the North Island by Colenso, Bidwill, and others. Since then the typical state of the species has been found to range from the Three Kings Islands and the North Cape to the East Cape and the northern portion of Hawke's Bay, but is seldom present in much quantity, and is often decidedly local. It is perhaps more common on the Little Barrier Island than in any other locality known to me. I am not aware that the typical form has been found in the South Island; but a variety with small leaves and caudate sepals was discovered at Nelson by Mr. W. T. L. Travers many years ago, but has not since been seen. Another variety with small trilobed leaflets, which also occurs in the North Island, has been collected at Okarita by Mr. A. Hamilton.

C. parviflora can always be distinguished from *C. fatida*, which is its nearest ally, by the small size, slender habit, smaller submembranous leaflets, narrower silky sepals, and particularly by the broad oblong anthers, which have a minute rounded knob at the tip of the connective. I am indebted to Mr. Hemsley for pointing out to me that my specimens from the Little Barrier Island and Cunningham's type from Whangaroa both show three sorts of individuals—males, females, and hermaphrodites. But in the last many of the anthers and carpels appear to be sterile.

PLATE 2. *Clematis parviflora*. The portions marked A drawn from specimens collected on the Little Barrier Island by Miss Shakespear; that marked B from Cunningham's type preserved in the Kew Herbarium. Fig. 1, stamen ($\times 6$); 2, carpel from flower ($\times 6$); 3, ripe carpel—all from Little Barrier specimens; 4 and 5, stamens from hermaphrodite flowers, Cunningham's type specimen.



M. Smith del
J. N. Fitch lith.

West, Newman imp.

RANUNCULUS LYALLII, Hook. f.

PLATE 3.—*RANUNCULUS LYALLII*.

FAMILY *RANUNCULACEÆ*.]

[GENUS *RANUNCULUS*, LINN.

Ranunculus Lyallii, Hook. f. *Handb. N.Z. Fl.* 4; *Cheesem. Man. N.Z. Fl.* 9.

Most travellers in the Southern Alps are acquainted with this magnificent plant, which Sir J. D. Hooker has well styled "the monarch of the genus." The large deep-green peltate or saucer-shaped leaves, sometimes 12 in. to 16 in. in diameter, and the tall paniculately branched flowering-stems, often bearing 15–20 large white flowers from 1 in. to 3 in. in diameter, are quite sufficient to arrest the attention of the most casual visitor. As the name indicates, it was first discovered by Dr. Lyall, the surgeon attached to H.M.S. "Acheron," which, under the command of Captain Stokes, was employed during the years 1847–51 in a survey of the southern shores of New Zealand. Lyall's specimens were obtained in Milford Sound, and consisted of leaves only. These gave no clue to the affinities of the plant, for in those days the existence of *Ranunculi* with peltate leaves was not even suspected. Hence in the "Flora Novæ Zelandiæ" it was simply alluded to as "a very remarkable possibly umbelliferous plant." This suggestion, which proved to be wide of the mark, was no doubt due to the similarity of the leaves to those of a gigantic *Hydrocotyle*. However, in the beginning of 1861 flowering specimens were obtained by Sir Julius von Haast and Dr. Sinclair in the Rangitara Valley, and the systematic position of the plant definitely ascertained. Since then it has been found to be abundant along the whole chain of the Southern Alps, from the Spenser Mountains in the Nelson Provincial District southwards to Mount Anglem in Stewart Island.

Ranunculus Lyallii is usually found by the margins of mountain-streams, or in moist hollows sheltered by subalpine scrub. Occasionally it can be seen covering considerable areas, which in the flowering season are whitened with the abundance of its flowers. It is most plentiful at an altitude of about 3,000 ft., but in several places I have seen it at an elevation of nearly 5,500 ft., and it descends as low as 1,500 ft. in a few localities on the western side of the Alps. In size and habit of growth it much resembles the well-known garden plant *Anemone japonica*; but it has much bolder foliage, and more striking flowers. It is much to be regretted that it is not better known in gardens, for although it has the reputation of being impatient of cultivation, a knowledge of the conditions favouring its growth, with careful management with regard to soil, situation, and supply of moisture, would probably bring about much more favourable results.

In the "Handbook" Sir J. D. Hooker has described an allied plant under the name of *R. Traversii*, the distinguishing characters of which are the more deeply crenate leaves with two incisions near the base, and the cream-coloured flowers. No specimens have been obtained of late years, but the examination of a careful drawing prepared from the type specimen and kindly forwarded to me by the Director of Kew leaves no doubt in my mind that it is nothing more than a trivial variety of *R. Lyallii*. Apart from this form *R. Lyallii* cannot be said to have any near allies, for although *R. Matthewsii* and *R. Buchananii* have very similar white flowers, they are much smaller in size, and the leaves are deeply lobed or even ternately divided. Outside New Zealand the only species known with peltate leaves are *R. Cooperi*, Oliv., and *R. Baurii*, McOwan, both natives of South Africa. But both of these are much smaller than *R. Lyallii*, and have yellow flowers with narrower petals. White-flowered *Ranunculi* are decidedly rare, except in the section *Batrachium*, which is not represented in New Zealand; and the existence of three such conspicuous plants as *R. Lyallii*, *R. Matthewsii*, and *R. Buchananii* constitutes a remarkable feature of the New Zealand flora.

PLATE 3. *Ranunculus Lyallii*, drawn from specimens collected in the Mount Cook district, Canterbury; alt. 3,000 ft. Fig. 1, base of petal, showing nectary; 2 and 3, stamens ($\times 6$); 4, pistil ($\times 6$); 5, fruit, with some of the carpels removed ($\times 2$); 6, ripe carpel (enlarged); 7, section of carpel (enlarged); 8, embryo (enlarged).



M. Smith del.
J. M. Fitch lith.

West, Newman imp.

RANUNCULUS NIVICOLA, Hook.

PLATE 4.—*RANUNCULUS NIVICOLA*.

FAMILY *RANUNCULACEÆ*.]

[GENUS *RANUNCULUS*. LINN.

Ranunculus nivicola, Hook. Ic. Plant. t. 571, 572; Cheesem. Man. N.Z. Fl. 12.

This graceful buttercup is nowhere more plentiful than on Mount Egmont, where it was discovered, in the summer of 1839, by Dr. Ernst Dieffenbach, the naturalist to the New Zealand Company, who was the first European to ascend the mountain. About the same time it was collected by Mr. Bidwill on Tongariro and Ruapehu, where, however, it does not attain the same luxuriance as on Egmont. Its abundance on the last-mentioned mountain greatly impressed me on my first ascent, made nearly thirty years ago. After passing through the forest region which girds the lower slopes of the mountain up to an elevation of nearly 4,000 ft., a subalpine scrub is reached, chiefly composed of *Olearia*, *Senecio*, *Coprosma*, *Veronica*, &c. In open sheltered places within this scrub *R. nivicola* flourishes in perfection, attaining a height of 3 ft., with radical leaves often more than 6 in. across, and with a branched flowering-stem bearing 8-15 large bright-yellow flowers $1\frac{1}{2}$ in. in diameter. Higher up, on the open mountain-side, it is smaller in size, and is usually found in the shelter of rocks, or on the sides of ravines. According to my own observations, its upward limit is about 5,500 ft. or slightly more. Dieffenbach states that he collected it at an altitude of "7,000 ft., near the perpetual snow," but this I believe to be altogether erroneous. Mr. Buchanan, who examined the vegetation of Egmont in 1867, gives 5,000 ft. as its limit. In 1907 I noticed it up to 5,800 ft. on the western side of Tongariro, and many years previously Mr. Kerry Nicholls reported to me that it occurred at an equivalent height on Ruapehu. Both on Egmont and Ruapehu all vegetation ceases before an elevation of 7,000 ft. is reached.

The chief home of *R. nivicola* is in the two localities mentioned above. I have, however, seen specimens gathered by Mr. Townson on Mount Holdsworth, one of the chief peaks of the Tararua Range, and I can entertain little doubt that it also exists on the Kaimanawa and Ruahine Mountains. Some flowerless specimens collected by Mr. J. H. Macmahon on Mount Stokes, Marlborough, apparently belong to the same species, but an element of doubt will remain until the flowers have been obtained.

The nearest ally of *R. nivicola* is undoubtedly *R. geraniifolius*. But that species differs in its smaller size and much more slender habit, fewer leaves which are often much divided, in the fewer and smaller flowers, and in the petals not being conspicuously notched at the apex. I am not acquainted with any extra-New-Zealand species which can be said to be closely allied. *R. anemoneus*, of the Australian Alps, with which Bentham compared it, differs in the more finely cut radical leaves, in the broader sessile cauline leaves, and in the white flowers. Probably its nearest relatives will be found in some of the South American species.

PLATE 4. *Ranunculus nivicola*, from specimens gathered on Mount Egmont, at an altitude of 4,000 ft. Fig. 1, base of petal, showing nectary ($\times 4$); 2, stamen ($\times 4$); 3, carpels from flower ($\times 4$); 4, ripe carpel (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

RANUNCULUS ENYSII, T. Kirk.

PLATE 5.—*RANUNCULUS ENYSII*.

FAMILY *RANUNCULACEÆ*.]

[GENUS *RANUNCULUS*. LINN.

Ranunculus Enysii, *T. Kirk in Trans. N.Z. Inst.* xii (1880), 394; *Cheesem. Man. N.Z. Fl.* 13.

Ranunculus Enysii is one of the most distinct species found in New Zealand, and although highly variable in many of its characters can never be confounded with any other member of the genus. It was first found, about the year 1878, by Mr. J. D. Enys, at that time resident at Castle Hill, in the Canterbury Alps. It fitly commemorates the services rendered to natural science in New Zealand by its discoverer, who for many years rendered invaluable assistance to every scientific explorer of the mountains of central Canterbury.

The range of *R. Enysii* is not precisely known, but it has been recorded from many localities in the Canterbury Alps, and is particularly abundant in the upper portion of the Waimakariri River basin, from Mount Torlesse to Bealey. In this district it is usually found in moist sheltered places along the sides of streams or ravines. I have not seen it at a lower elevation than 1,800 ft., and apparently it does not ascend higher than 4,000 ft., above which its place is taken by the more alpine *R. Sinclairii*. Outside Canterbury the only localities that I know for it are the Taieri Hills, in eastern Otago, from whence specimens were described by Mr. J. Buchanan under the name of *R. tenuis* (*Trans. N.Z. Inst.* xx (1888), 255, t. 12), but which clearly represent a form of *R. Enysii* with more pinnately divided leaves than usual; and Lake Harris, in western Otago, where it was gathered by the late Mr. T. Kirk.

The affinities of *R. Enysii* are obscure. Mr. Kirk compared it with *R. lappaceus*, and no doubt there is a superficial resemblance to highly developed forms of that species; but it differs altogether in the glabrous habit, more deeply divided leaves, and particularly in the turgid achene, which is never compressed or margined, as in that species. A relationship to *R. geraniiifolius* has also been suggested, but the resemblances are by no means convincing.

PLATE 5. *Ranunculus Enysii*, drawn from specimens collected by the Broken River, Canterbury Alps, at an altitude of 2,500 ft. Fig. 1, petal, showing nectary ($\times 3$); 2, stamen ($\times 8$); 3, carpel from flower ($\times 8$); 4, ripe carpel ($\times 8$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

RANUNCULUS SERICOPHYLLUS, Hook f.

PLATE 6.—*RANUNCULUS SERICOPHYLLUS*.

FAMILY *RANUNCULACEÆ*.]

[GENUS *RANUNCULUS*, LINN.

Ranunculus sericophyllus, Hook. f. *Handb. N.Z. Fl.* 6; *Cheesem. Man. N.Z. Fl.* 17.

This beautiful little plant was originally discovered by the late Sir Julius von Haast during his adventurous explorations in the Southern Alps. His first specimens were obtained in May, 1862, near the source of the Hopkins River, which, after uniting with the Dobson, flows into the head of Lake Ohau. In the following year he also collected it on Mount Brewster, near the head of Lake Wanaka. Since then it has been observed in many localities in the central portions of the Southern Alps, from the head of the Waimakariri River southwards to the divide between Lakes Wakatipu and Te Anau on the one side and the Sounds of south-western Otago on the other. It is everywhere a high alpine plant, and is seldom seen below 4,000 ft. altitude. In the Mount Cook district, where I have repeatedly gathered it, it is most plentiful in sheltered hollows in which the drainage from melting snowfields keeps the soil perpetually moist. In such places it may be seen forming patches several yards in diameter, and from its silky pale-green leaves and abundant bright-yellow flowers presents a very charming and attractive appearance. It ascends to an altitude of over 6,500 ft., and can frequently be observed blooming within a few feet of permanent snowfields. In fact, it is often the last conspicuous plant seen by the alpine climber when ascending the higher mountains of the Southern Alps.

As a species *R. sericophyllus* is remarkably distinct from all the other New Zealand forms. Sir J. D. Hooker has compared it with the Tasmanian and Victorian *R. Gunnianus*; but, as remarked by him, it is much more robust and silky, with larger flowers, and more membranous leaves, the ultimate segments of which are smaller and shorter.

PLATE 6. *Ranunculus sericophyllus*, drawn from specimens obtained in the Mount Cook district, Canterbury; alt. 5,500 ft. Fig. 1, petal, showing the three nectariferous glands ($\times 2$); 2 and 3, stamens, front and back view ($\times 4$); 4, carpel from flower ($\times 4$); 5 and 6, ripe carpels (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp

RANUNCULUS AUCKLANDICUS, A. Gray.

PLATE 7.—*RANUNCULUS AUCKLANDICUS*.

FAMILY *RANUNCULACEÆ*.]

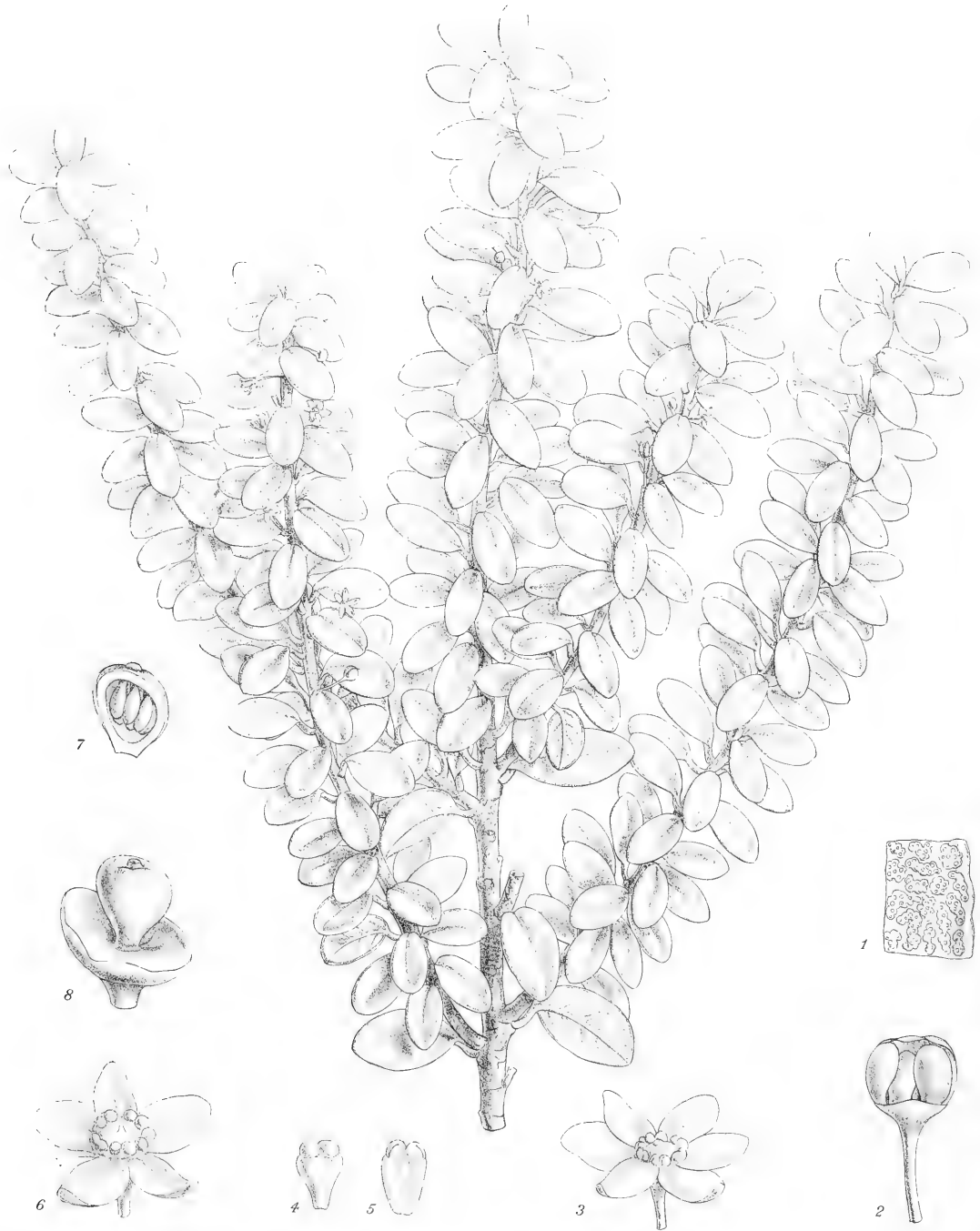
[GENUS *RANUNCULUS*, LINN.

Ranunculus aucklandicus, A. Gray, *Bot. U.S. Expl. Exped.* i, 8; *Cheesem. Man. N.Z. Fl.* 22.

So far this species has only been recorded from the Auckland Islands. For its discovery we are indebted to the United States Exploring Expedition, which, as is well known, was engaged in geographical researches in the southern seas during the years 1838-42. The brig "Porpoise," one of the vessels composing the expedition, paid a visit to the Auckland Islands when returning from a cruise to the Antarctic regions, anchoring in Port Ross on the 7th March, 1840. A stay of three days only was made, but during that period Dr. Holmes, the surgeon attached to the vessel, formed a small collection of plants, among which were specimens of a species of *Ranunculus*. After the return of the expedition these were described by Asa Gray under the name of *Ranunculus aucklandicus*. Curiously enough, the plant was not observed by Hooker, in Ross's expedition, nor by the French expedition under the command of Admiral D'Urville. Subsequent visitors, however, have found it by no means uncommon in swampy places, especially near the sea. I have seen specimens collected by Mr. T. Kirk in 1890, by Dr. Cockayne in 1903, by Mr. Aston and Mr. J. S. Tennant in 1907, and again by Mr. Aston in 1909. To the last-mentioned gentleman I am indebted for the specimens from which this plate has been prepared, representing a somewhat luxuriant form of the species.

The nearest relative of *R. aucklandicus* is undoubtedly Hooker's *R. subscaposus*, from Campbell Island, which in fact differs only in its smaller size and ovate-deltoid more acutely lobed leaves, which are usually 3-partite to the base. It is quite possible that a leisurely examination of the two plants might result in their union. Dr. Gray, in the "Botany of the United States Exploring Expedition," suggests that *R. aucklandicus* is allied to *R. pinguis*. But this is clearly erroneous, as it differs altogether in habit, in the 3-cleft and more deeply lobed much less succulent leaves, in the appressed strigose pubescence, in the smaller flowers, and in the altogether different achene, which wants the subulate style winged at the base so characteristic of *R. pinguis*. The achene of *R. aucklandicus* belongs to the same type as that of *R. hirtus*, but is less compressed and less evidently margined, and is slightly villous with long scattered hairs, especially when young, and the style is short and hooked.

PLATE 7. *Ranunculus aucklandicus*, drawn from specimens collected on the Auckland Islands by Mr. B. C. Aston. Fig. 1, flower ($\times 3$); 2, sepal, outer face ($\times 5$); 3, petal ($\times 5$); 4, stamen ($\times 5$); 5, carpel from flower ($\times 5$); 6, ripe carpel (enlarged); 7, section of ripe carpel (enlarged); 8, embryo (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

DRIMYS TRAVERSII, T. Kirk.

PLATE 8.—DRIMYS TRAVERSII.

FAMILY MAGNOLIACEÆ.]

[GENUS DRIMYS, FORST.

Drimys Traversii, T. Kirk in *Trans. N.Z. Inst.* xxx (1898), 379; *Cheesem. Man. N.Z. Fl.* 30.

For the discovery of *Drimys Traversii* we are indebted to Mr. H. H. Travers, who, in December, 1882, collected it in the mountains behind Collingwood, north-west Nelson. Mr. Travers's specimens, which were in a very imperfect condition, were communicated to Mr. Buchanan, and were erroneously referred by him to the genus *Hymenanthera* (*Trans. N.Z. Inst.* xv (1883), 339, t. 28). This mistake was not rectified until 1897, when Mr. J. Dall, well known from his botanical explorations in the Collingwood district, succeeded in obtaining a supply of both flowering and fruiting examples. These were forwarded to the late Mr. Kirk, and enabled him to refer the plant to its proper genus. Since then it has been collected by Mr. W. Townson on Mount Rochfort and Mount Frederic, near Westport; so that it probably stretches along the coast ranges from West Wanganui and Karamea to the mouth of the Buller. Its altitudinal range appears to be from 1,500 ft. to 3,000 ft.

As a species *D. Traversii* is remarkably distinct. It is by far the smallest species of the genus, sometimes barely exceeding 2 ft. in height, and its straggling or semi-prostrate habit is unique. The small close-set leaves, with their appressed petioles, and the reddish bark, also distinguish it at a glance from either *D. axillaris* or *D. colorata*.

The distribution of *Drimys* is most puzzling. Sixteen or seventeen species are known, of which three are found in New Zealand, four in Australia, one in Lord Howe Island, four or five in New Caledonia, one or two in New Guinea, one of which also extends to Borneo and the Philippine Islands. Three species (or more, according to the different views of authors) occur in South America, stretching from Mexico to Fuegia. Its distribution is therefore very similar to that of *Nertera* and *Uncinia*. The present centre of the genus is undoubtedly in Australia and New Caledonia, and an Austral-Malayan origin might have been predicted for it but for the isolated species found in South America.

PLATE 8. *Drimys Traversii*, drawn from specimens collected by Mr. W. Townson on Mount Rochfort, near Westport, at an altitude of 2,500 ft. Fig. 1, portion of under-surface of leaf, showing indumentum; 2, flower-bud ($\times 5$); 3, hexapetalous flower ($\times 5$); 4 and 5, stamens, front and back view ($\times 8$); 6, pentapetalous flower ($\times 5$); 7, section of fruit, showing seeds ($\times 8$); 8, fruit, showing the persistent saucer-shaped calyx ($\times 8$).

PLATE 9.—NASTURTIIUM LATESILIQUA.

FAMILY CRUCIFER E.]

[GENUS NASTURTIIUM, R. BR.

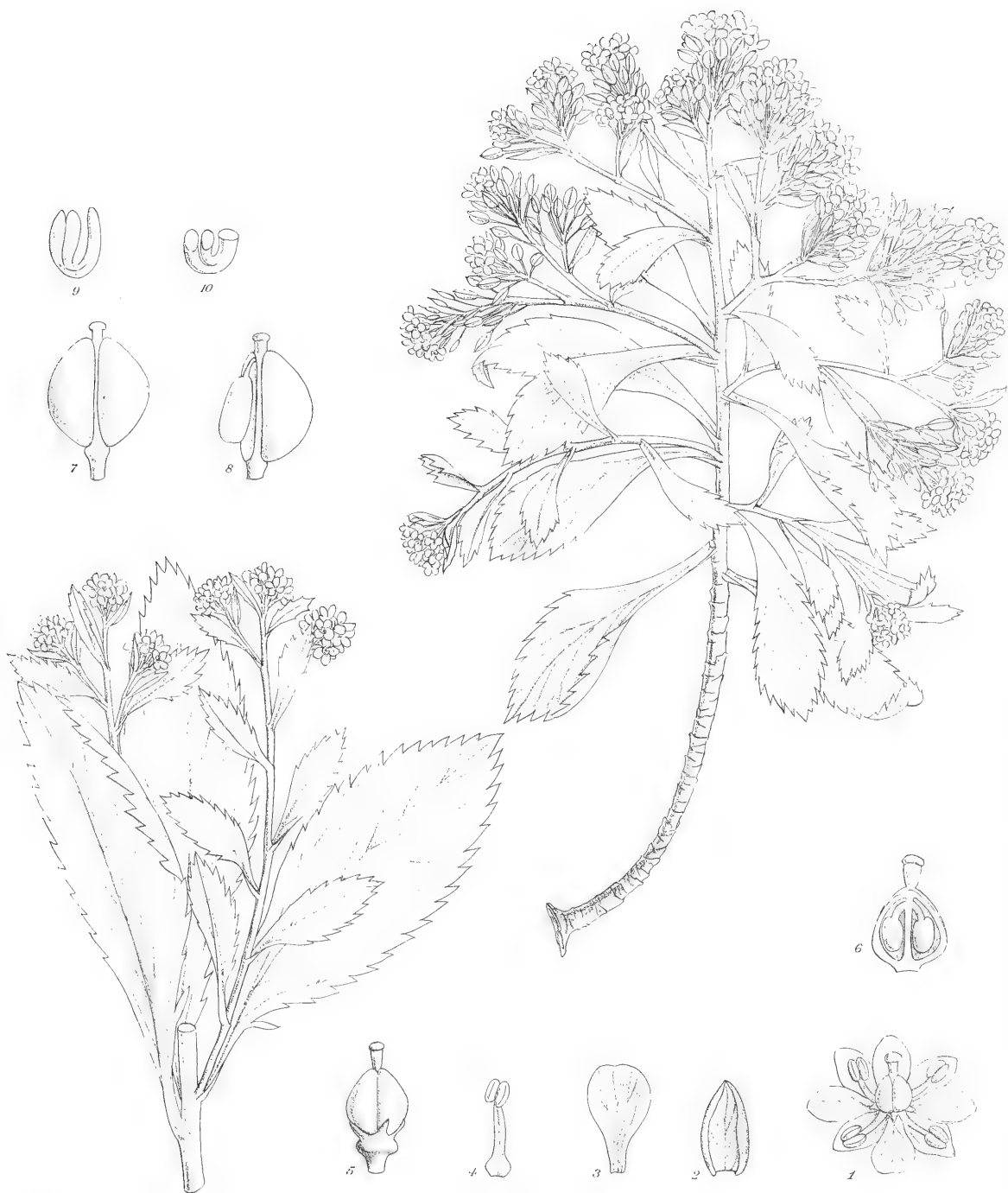
Nasturtium latesiliqua, *Cheesem. in Trans. N.Z. Inst.* xliii (1911), 179.

Cardamine latesiliqua, *Cheesem. in Trans. N.Z. Inst.* xv (1883), 298; *Man. N.Z. Fl.* 35.

The first specimens of this fine plant were gathered by myself in the summer of 1881, during a botanical expedition to the Mount Arthur Plateau, Nelson. It was then abundant on limestone rocks on the northern side of Mount Arthur, ranging from a height of 3,800 ft. to 5,500 ft., or within a short distance of the summit of the mountain. Two years later I found it equally plentiful on the northern slopes of Mount Owen, in the Upper Buller Valley. Since then it has been gathered by Mr. F. G. Gibbs and others on several of the high peaks in north-west Nelson, almost always on limestone rocks.

When publishing the species in 1883 I referred it to *Cardamine*, being mainly influenced by its evident relationship to Hooker's *C. fastigiata*, from which it differs in the villous leaves, larger flowers, and much broader more turgid pods. But, as pointed out in the Manual, both *C. fastigiata* and *C. latesiliqua*, together with the allied *C. Enysii*, differ from the typical species of *Cardamine* in the 2-seriate seeds. Consequently Dr. Schulz, in his elaborate monograph of the genus published in Engler's "Botanische Jahrbuchern" for 1903 (vol. xxxii), excludes all three, but makes no other disposition of them. But although there is no difficulty in justifying the exclusion of the species from *Cardamine*, it is far from easy to decide in what other genus they should be placed. Personally, I look upon it as quite possible that the three species in question, together with the Australian *C. radicata* Hook. f., will ultimately form a separate genus. But before taking a step of that kind a careful comparison should be made with the whole of the genera constituting the subfamily *Arabidæ*, a work which can hardly be properly carried out without access to the large public herbaria and libraries of Europe. Partly from that reason, and partly because the characters of *Nasturtium*, although not exactly conformable, still approach very closely to those of the four species mentioned above, I have decided to transfer them to that genus for the present. (See some remarks in a paper of mine published in the "Transactions of the New Zealand Institute," vol. xliii (1911), 178.)

PLATE 9. *Nasturtium latesiliqua*, drawn from specimens collected by Mr. F. G. Gibbs and myself on Mount Arthur, Nelson, at an altitude of 4,000 ft. Figs. 1 and 2, flowers ($\times 3$); 3, petal (enlarged); 4, stamens and pistil ($\times 5$); 5, pistil ($\times 8$); 6, section of portion of pod, showing 2-seriate seeds (enlarged); 7, section of seed, showing position of embryo (enlarged); 8, 9, 10, 11, 12, various embryos, variously magnified.



M. Smith del.
J.N. Fitch lith.

West. Newman imp.

LEPIDIUM OLERACEUM, Forst.

PLATE 10.—LEPIDIUM OLERACEUM.

FAMILY CRUCIFERÆ.]

[GENUS *LEPIDIUM*, LINN.]

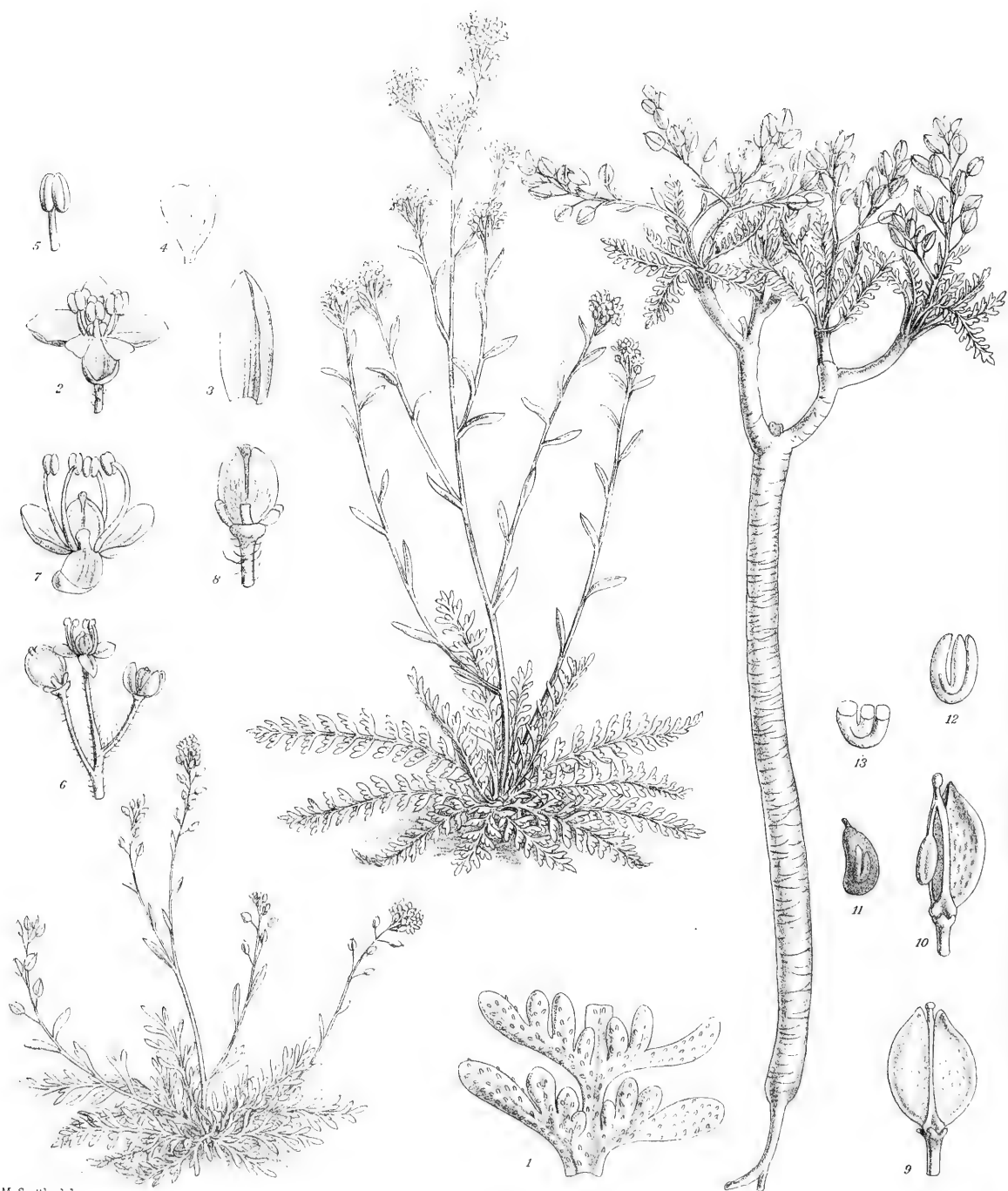
Lepidium oleraceum, Forst. Prodr. n. 248; Cheesem. Man. N.Z. Fl. 38.

This plant, which has long been known as "Captain Cook's scurvy grass," was first discovered during that illustrious navigator's first visit to New Zealand in 1769. In Dr. Solander's "*Primitiæ Floræ Novæ Zelandiæ*," which contains manuscript descriptions of the plants collected by Banks and Solander during the voyage, it is described with considerable detail, and an excellent plate was prepared for the series of illustrations intended to accompany the work. At that time it must have been much more plentiful than is now the case, for Dr. Solander speaks of it as "copiose in littoribus marinis Novæ Zelandiæ," and states that it was observed in all the localities where Cook landed; while Cook himself remarks that boat-loads of it were collected and used as an antiscorbutic by his crew. Forster, who accompanied Cook in his second voyage, published the species in his "*Prodromus*," but his description is short and unsatisfactory. In his "*Esculent Plants*," however, he gives a much fuller account, stating that during the stay of the expedition in Queen Charlotte Sound large quantities of it, together with *Apium* and *Tetragonia*, were collected for the use of the crew, and he goes so far as to remark that "inter alimenta antiscorbutica nunquam satis laudandum." A. Richard, in the "*Botany of the Voyage of the 'Astrolabe'*," also speaks of it as being abundant, and repeats Forster's views as to its value as an antiscorbutic.

Lepidium oleraceum is one of the few plants which range through the whole length of the Dominion, from the Kermadec Islands in the north to the Auckland Islands in the south. It is usually found on rocky shores, but as a rule is far more plentiful on detached islets than on the mainland. It appears to specially affect places frequented by sea-birds for breeding purposes, as, for instance, on the Three Kings Islands, where I observed it growing with the greatest luxuriance on the richly manured soil of the large gannet rookery on the Western King; and on Cuvier Island, where it forms patches near the burrows of the mutton-birds (*Puffinus*). On the whole, however, it can hardly be said to be a plentiful species at the present time, whatever its position may have been in Cook's days, and I know of very few localities where "boat-loads" of it could now be obtained.

The nearest allies of *L. oleraceum* are undoubtedly Mr. Kirk's two species *L. Banksii* and *L. obtusatum*, the first of which, in fact, may be nothing more than a variety. Outside New Zealand its closest relatives appear to be a group of which the Australian *L. foliosum* and the Polynesian *L. piscidium* may be taken as types.

PLATE 10. *Lepidium oleraceum*, drawn from specimens collected on Cuvier Island, between the Great Barrier Island and Cape Colville. Fig. 1, flower (enlarged); 2, sepal, and 3, petal (both enlarged); 4, stamen (enlarged); 5, pistil (enlarged); 6, section of pistil, showing position of ovules (enlarged); 7, ripe fruit, (enlarged); 8, fruit, with one valve removed, showing the seed suspended from the top of the septum (enlarged); 9, embryo, showing the incumbent cotyledons (enlarged); 10, section of embryo (enlarged).



M. Smith del.
J.N. Fitch lith

LEPIDIUM SISYMBRIOIDES, Hook. f.

West, Newman imp.

PLATE 11.—LEPIDIUM SISYMBRIOIDES.

FAMILY CRUCIFERÆ.]

[GENUS *LEPIDIUM*, LINN.]

Lepidium sisymbrioides, Hook. f. *Handb. N.Z. Fl.* 14; *Cheesem. Man. N.Z. Fl.* 42.

This species, with its depressed habit, pinnatifid leaves, and small diœcious flowers, offers a strong contrast to the subject of the previous plate, which has tall branching stems, undivided serrate leaves, and numerous larger flowers. It was first collected in 1862 by Sir Julius von Haast on grassy flats near Lake Ohau, and a year or two later by Mr. Buchanan in the Waitaki Valley, northern Otago. Since then it has been observed in many localities on the eastern side of the Southern Alps, from North Canterbury southwards to Central Otago. It is most often seen in the interior plains or basins which occur in several localities on the eastern slopes of the Southern Alps, such as the Broken River basin, the Mackenzie Plains, the Lake district of Otago, &c.; which, from their situation and physical surroundings, have a more or less steppe-like or arid climate.

My own acquaintance with *L. sisymbrioides* dates back to 1880, when my friend Mr. J. D. Enys, then resident in the Broken River basin, showed me several stations in which it was abundant, most of them being patches of debris at the foot of limestone cliffs. In such situations the *Lepidium* formed isolated clumps 6 in. to 12 in. across. Old plants were remarkable for their stout cylindrical root, which sometimes was quite 4 ft. in length and as thick as the finger, its size seeming altogether out of proportion to the short stems.

The nearest allies of *L. sisymbrioides* are undoubtedly *L. Kawarau* and *L. Matau* from Central Otago, which agree with it in the diœcious habit and the general characters of the flowers and fruit. But both have a much taller and more erect mode of growth, with numerous cauline leaves, and the size, shape, and cutting of the radical leaves are different. Dr. Thellung, in his recently issued monograph of the genus, treats all three as varieties of one species; but I feel sure that no New Zealand botanist familiar with their appearance in the field will agree with this view.

PLATE 11. *Lepidium sisymbrioides*, male, female, and fruiting specimens, collected at Castle Hill, Canterbury Alps, at an elevation of 2,500 ft. Fig. 1, portion of leaf ($\times 8$); 2, male flower ($\times 8$); 3, sepal ($\times 10$); 4, petal ($\times 8$); 5, anther ($\times 10$); 6, portion of female inflorescence, showing sterile stamens (enlarged); 7, female flower, with sterile stamens ($\times 8$); 8, pistil ($\times 10$); 9, pod (enlarged); 10, pod, with one valve removed, showing the seed suspended from the top of the septum (enlarged); 11, seed (enlarged); 12, embryo, showing incumbent cotyledons (enlarged); 13, section of embryo (enlarged).

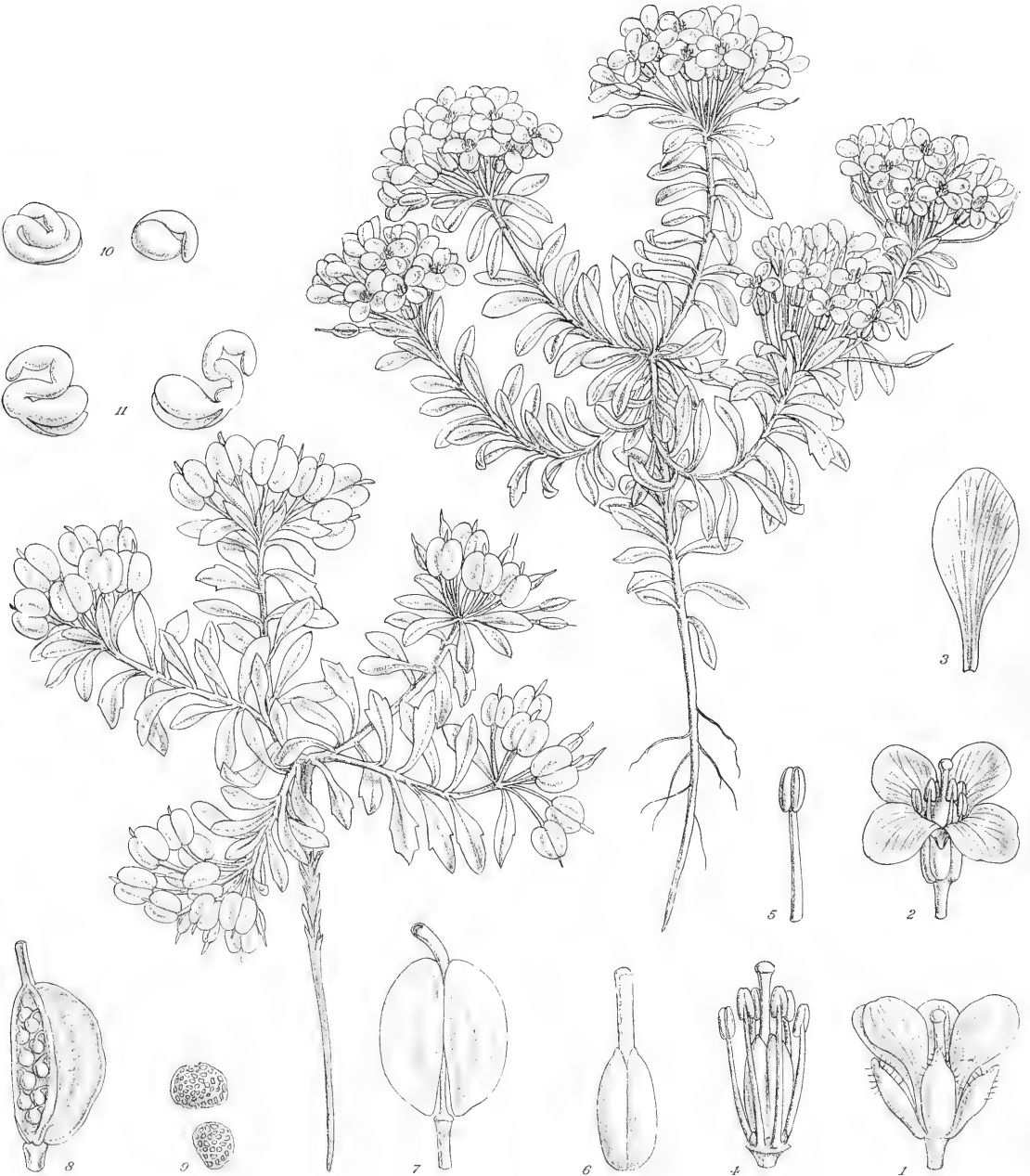


PLATE 12.—NOTOTHLASPI AUSTRALE.

FAMILY CRUCIFERÆ.]

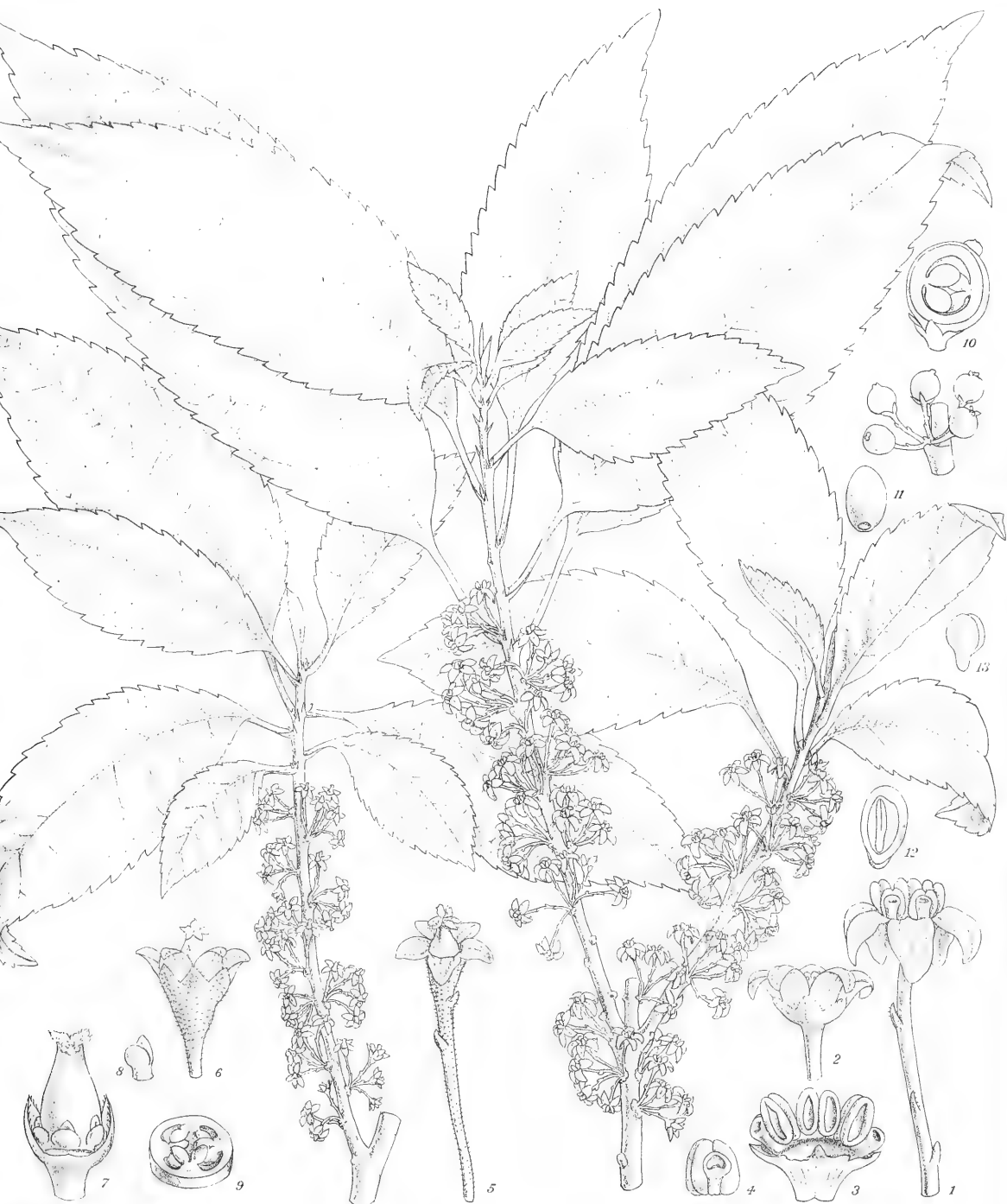
[GENUS NOTOTHLASPI, HOOK. F.

Notothlaspi australe, Hook. f. *Handb. N.Z. Fl.* 15; *Cheesem. Man. N.Z. Fl.* 43.

The genus *Notothlaspi*, to which the subject of this plate belongs, is a remarkable endemic genus confined to the mountains of the South Island; and which, while possessing the main characters of the tribe *Lepidineæ*, differs from *Lepidium* and most of the allied genera in the very numerous seeds with long funicles. *Notothlaspi australe* was originally discovered in the Nelson mountains by Sir David Monro, who was one of the first explorers of the northern portions of the South Island. It is now known to be abundant in mountain districts throughout the whole of Nelson and Marlborough, ranging from 2,500 ft. to 5,000 ft. altitude, but so far as I am aware has not been observed to the south of Lake Tennyson. It is usually found on rocky or shingly slopes, and in such situations often forms a considerable proportion of the vegetation.

The remaining species, *N. rosulatum*, is one of the most singular plants in the Dominion, and I much regret that the exigencies of space prevent me from giving a plate of it as well. Flowerless specimens form flat rosettes of closely placed imbricating leaves, the appearance of which has doubtless suggested the local name of "pen-wiper plant," by which it is known in several parts of the South Island. When in bloom, however, it is furnished with a stout scape or peduncle, which bears numerous sweet-scented flowers, and it then assumes a pyramidal or narrow conical shape. *N. rosulatum* is invariably found on loose shingle-slopes, and is held in place by numerous thread-like roots, which penetrate the shingle to a great depth.

PLATE 12. *Notothlaspi australe*, drawn from specimens collected by Mr. F. G. Gibbs on Dun Mountain, Nelson, at an altitude of 4,000 ft. Figs. 1 and 2, flowers; 3, petal; 4, stamens and pistil; 5, stamens; 6, pistil; 7, pod; 8, pod, with one valve removed to show position of seeds; 9, seeds; 10, embryos, showing the long radicle; 11, embryos, with the radicle pulled apart. (All enlarged.)



J. Smith del.
N. Pritch lith.

West, Newman imp.

MELICYTUS RAMIFLORUS, Forst.

PLATE 13.—MELICYTUS RAMIFLORUS.

(THE MAHOE.)

FAMILY VIOLARIÆÆ.]

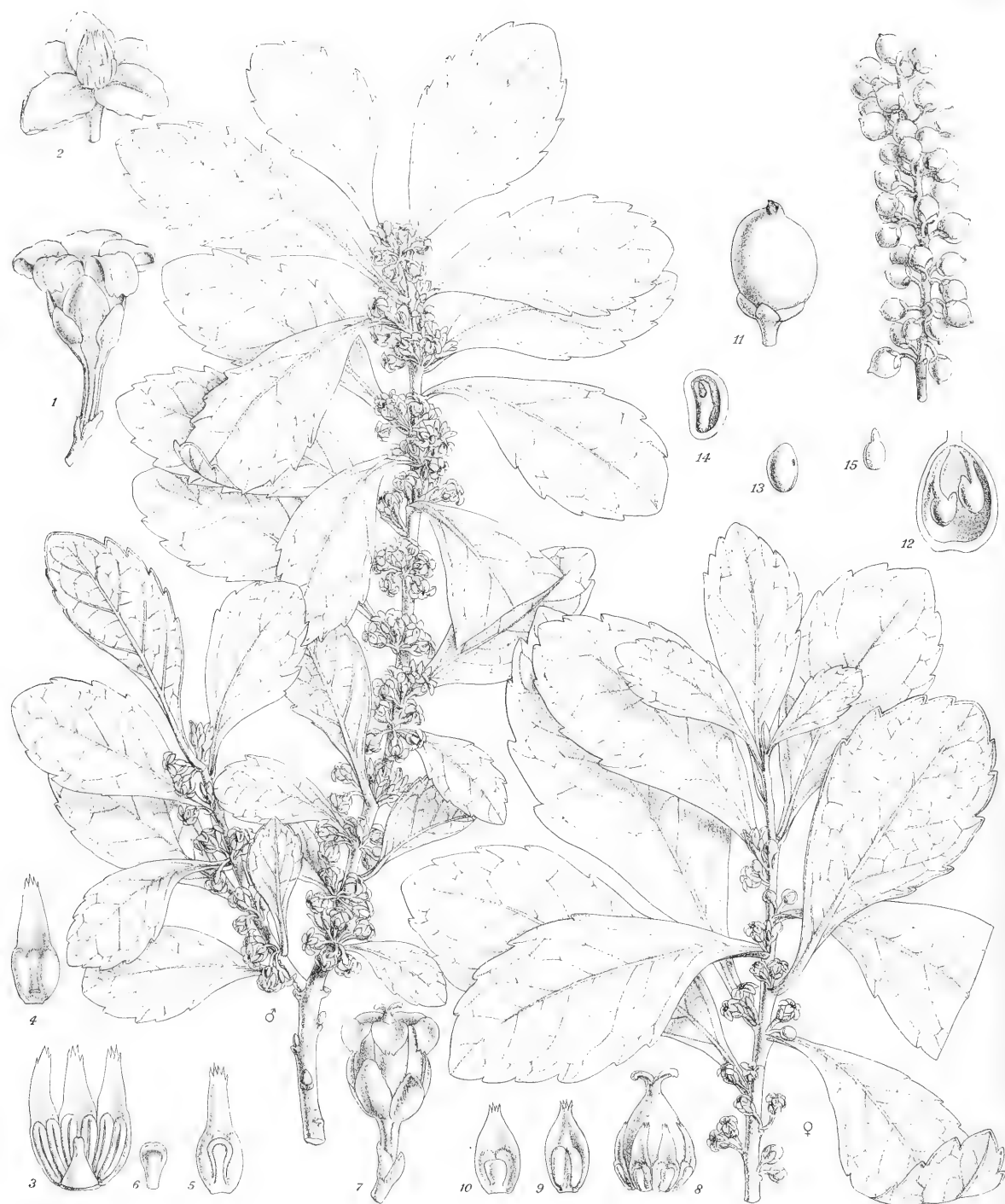
[GENUS MELICYTUS, FORST.

Melicytus ramiflorus, Forst. Char. Gen. 124, t. 62; Cheesem. Man. N.Z. Fl. 46.

Melicytus ramiflorus was one of the first New Zealand plants to become known to Europeans, for it was among those gathered by Sir Joseph Banks and Dr. Solander when Cook first landed, in October, 1769, not far from the site of the present town of Gisborne. It was also observed in most of the localities visited by Cook during his first voyage, and was drawn and described by Solander in his manuscript "Primitiæ Floræ Novæ Zelandiæ." In Cook's second voyage it was again gathered by Forster, and on his return to Europe was published under the name it now bears. Subsequent observation has proved that it is generally distributed throughout the whole of the Dominion, from the Kermadec Islands to Stewart Island, and from sea-level to quite 3,000 ft. It is also a native of Norfolk Island, and of the Island of Eua, in the Tongan Group, and has lately been gathered by Miss L. S. Gibbs in Fiji (Journ. Linn. Soc. xxxix, 140).

Melicytus ramiflorus is generally known to the colonists by its Maori name of mahoe. It usually forms a small round-topped tree 20 ft. to 30 ft. high, with a trunk 1 ft. to 1½ ft. in diameter, but in rich warm soils, as, for instance, in the forests surrounding the base of Mount Egmont, it often attains a much larger size. In such situations it is common for the trunk to be branched from the very base, the tree then consisting of a number of bare stems springing from a huge distorted rootstock. The young branches are excessively brittle; and, with the foliage, are greedily eaten by cattle and horses. The wood is soft, and valueless for most purposes, but has been used for producing a special kind of charcoal for the manufacture of gunpowder.

PLATE 13. *Melicytus ramiflorus*, drawn from specimens collected at Mount Wellington, near Auckland. Figs. 1 and 2, male flowers; 3, section of flower; 4, stamen, showing the nectariferous cavity at the top of the connective; 5 and 6, female flowers; 7, female flower, with the petals removed, showing rudimentary stamens at the base of the pistil; 8, rudimentary stamen; 9, section of ovary, showing the parietal placentas and ovules; 10, section of fruit; 11, seed; 12, section of seed; 13, embryo. (All enlarged.)



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

HYMENANTHERA NOVAE-ZELANDIAE, Hemsl.

PLATE 14.—HYMENANTHERA NOVÆ-ZELANDIÆ.

FAMILY VIOLARIÆ.]

[GENUS HYMENANTHERA, R. BR.

Hymenanchera novæ-zelandiæ, Hemsl. in *Kew Bulletin*, 1908, 95.

H. latifolia, T. Kirk in *Trans. N.Z. Inst.* iii (1871), 163; *Cheesem. Man. N.Z. Fl.* 50, non Endl.

The first discoverer of this plant was the Australian botanist Richard Cunningham, who, in 1834, collected fruiting specimens on maritime rocks opposite the Cavallos Islands, between the Bay of Islands and Whangaroa. His brother, Allan Cunningham, the talented author of the well-known "*Precursor Floræ Insularum Novæ Zelandiæ*," altogether mistook the affinities of the plant, and erroneously described it as a *Scævola*, under the name of *S. novæ-zelandiæ*. Sir J. D. Hooker, when engaged on the "*Flora Novæ Zelandiæ*," correctly transferred it to *Hymenanchera*, but unfortunately confused it with another species of the genus plentiful in coastal localities on both sides of Cook Strait, to which he applied the name of *H. crassifolia*. The plate given by Hooker in the *Flora* was such an accurate representation of the southern species that no suspicion was raised in the minds of New Zealand botanists as to Cunningham's plant being in any way different.

In 1867 Mr. Buchanan collected a large-leaved *Hymenanchera* in the North Cape district, and about the same time Mr. Kirk obtained the same plant on the Great and Little Barrier Islands. Influenced by its evident similarity to the Norfolk Island *H. latifolia*, Mr. Kirk referred it to that species, and in the absence of any means of comparing the two plants this identification was acquiesced in by New Zealand botanists. When the preparation of this work was taken in hand it became desirable to settle the matter, and at my request Mr. Hemsley made a comparison of the New Zealand and Norfolk Island plants, with the result of proving the distinctness of the two. Proceeding to compare the whole of the New Zealand *Hymenancheræ*, Mr. Hemsley further ascertained that Cunningham's *Scævola novæ-zelandiæ* was identical with Buchanan's and Kirk's plant. That being the case, the name under which it will be known in the future must be *H. novæ-zelandiæ*, Hemsl.

Our plant is decidedly rare on the mainland of New Zealand, the only localities that I am acquainted with being two or three on the North Cape Peninsula, and Cunningham's original station at Matauri Bay, opposite the Cavallos Islands. But it is plentiful on almost all the outlying islands, from the Three Kings Group southwards to Mayor Island and Karewa Island, in the Bay of Plenty. It can be readily distinguished from all the New Zealand species except *H. Traversii* by the large and broad sinuate-toothed leaves and numerous flowers. *H. Traversii* is so close to it that Mr. Hemsley has suggested that it should be treated as a variety only; but its leaves are longer and narrower, and more sharply serrate, and the berries are said to be 4-seeded.

PLATE 14. *Hymenanchera novæ-zelandiæ*, drawn from male, female, and fruiting specimens collected on the Little Barrier Island by Miss Shakespear. Fig. 1, male flower ($\times 6$); 2, calyx and stamens ($\times 6$); 3, three stamens seen from the inner side, showing the large fimbriate connectives ($\times 12$); 4, single stamen seen from the inner side ($\times 12$); 5, single stamen, showing the adnate scale on the back of the connective ($\times 12$); 6, scale seen separately ($\times 12$); 7, female flower ($\times 6$); 8, pistil, with rudimentary stamens at the base ($\times 6$); 9 and 10, front and back view of rudimentary stamens ($\times 8$); 11, ripe fruit ($\times 2$); 12, section of ovary, showing ovules ($\times 8$); 13, seed ($\times 2$); 14, section of seed ($\times 3$); 15, embryo ($\times 10$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PITTOSPORUM ELLIPTICUM, T. Kirk.

PLATE 15.—PITTOSPORUM ELLIPTICUM.

FAMILY PITTOSPORACEÆ.]

[GENUS PITTOSPORUM, BANKS.

Pittosporum ellipticum, T. Kirk in *Trans. N.Z. Inst.* iv (1872), 266; *Cheesem. Man. N.Z.* Fl. 57.

I understand that this fine species was first collected by Dr. Sinclair, between the years 1852–54, on Mount Manaia, Whangarei; but as his specimens were not in flower or fruit they were not dealt with, either in the “*Flora Novæ Zelandiæ*” or in the subsequently published “*Handbook*.” In 1867 Mr. John Buchanan gathered it at Whangaroa, and in the following year Mr. Kirk rediscovered it on Mount Manaia. In 1872 I found it in abundance in the densely wooded ranges immediately to the north of the Manukau Heads, so far the only station known on the western side of the Island. In addition to the above, varieties, or closely related forms, are known from the Ohinemuri Gorge, the dividing range a few miles south of Te Aroha, and near the base of Hikurangi Mountain, East Cape district.

P. ellipticum forms a small spreading tree 15 ft. to 25 ft. high, with black bark. Its nearest ally is undoubtedly *P. virgatum*, but that species is abundantly distinct in the lobed or pinnatifid leaves of the juvenile plants, in the much narrower leaves of the adult, and in the smaller flowers and capsules. *P. Ralphii* is markedly different in habit, in the copious white tomentum, in the shape of the leaves, and in the flowers and fruit.

The northern distribution of *Pittosporum* is noteworthy. Out of the nineteen species found in New Zealand nine are endemic in the North Island, two are confined to the South Island, and seven are found in both Islands. Only four species are found to the south of Banks Peninsula. The genus does not extend to the Chatham Islands, and only one species occurs in the Kermadec Islands.

PLATE 15. *Pittosporum ellipticum*, drawn from specimens collected on the coast to the north of the Manukau Harbour. Fig. 1, male flower, with the petals removed ($\times 3$); 2, petal ($\times 3$); 3, stamen ($\times 5$); 4, ovary ($\times 5$); 5, hairs from ovary (enlarged); 6, female flower, with the petals removed ($\times 3$); 7, petal ($\times 3$); 8, section of ovary (enlarged); 9, seed (natural size); 10, section of seed ($\times 3$); 11, embryo ($\times 5$).





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

PITTOSPORUM CRASSIFOLIUM, A. Cunn.

PLATE 16.—PITTOSPORUM CRASSIFOLIUM.

(THE KARO.)

FAMILY PITTOSPORACEÆ.]

[GENUS PITTOSPORUM, BANKS.

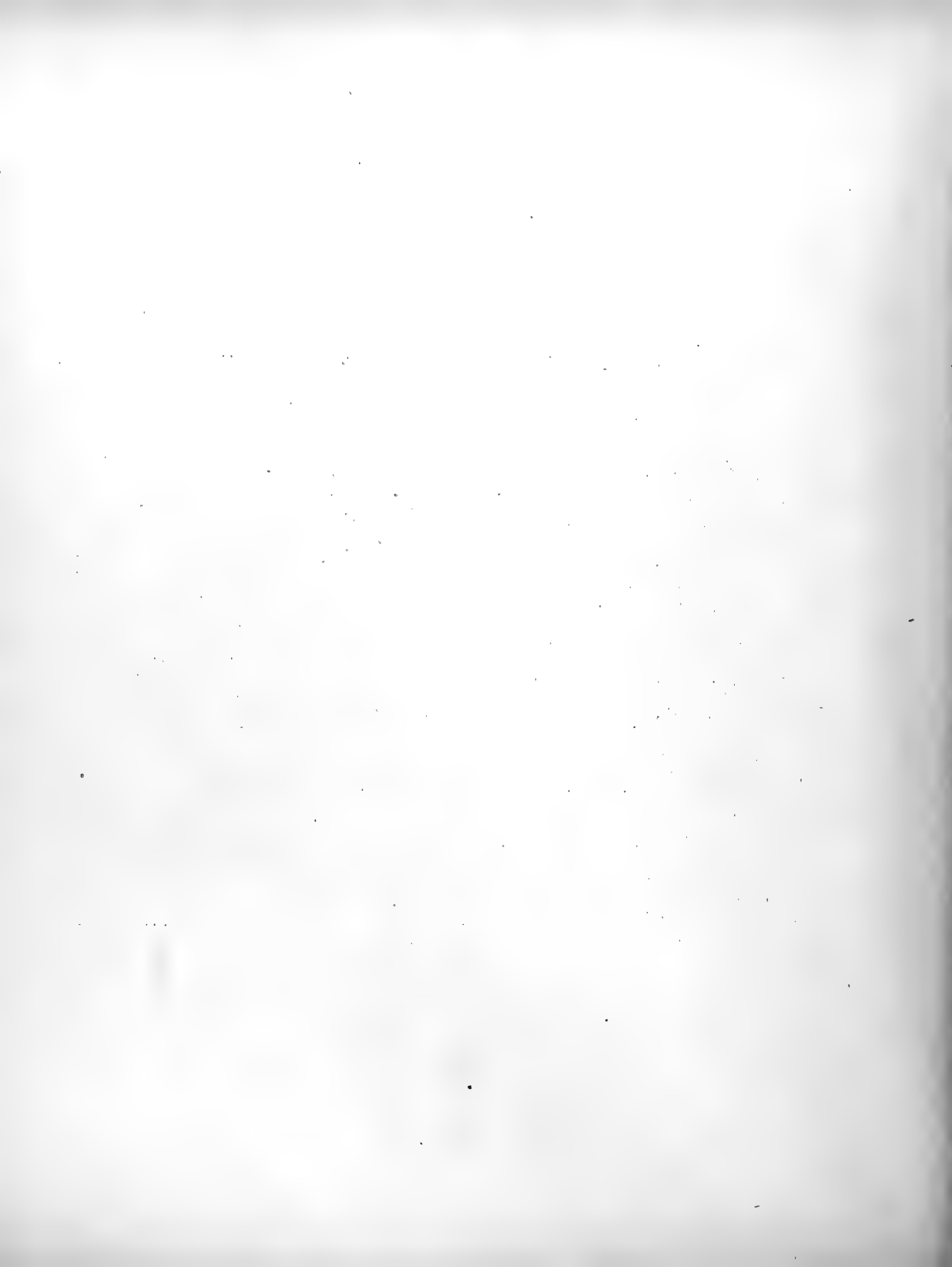
Pittosporum crassifolium, A. Cunn. *Precur.* n. 612; *Cheesem. Man. N.Z. Fl.* 58.

The name of *Pittosporum crassifolium* was applied to this plant by Allan Cunningham in the belief that it was identical with a species collected by Banks and Solander at Poverty Bay during Cook's first visit in 1769, and which bore the same name in Solander's manuscripts. In this view, however, Cunningham was mistaken. Solander's plant having since been proved, from his own specimens, to be the very different *P. Ralphii*. As Cunningham's name was the first actually published, it must be retained for the plant which he described.

Pittosporum crassifolium has a very restricted geographical distribution. It occurs sparingly in the Kermadec Islands, is fairly plentiful along the coast-line of the North Island, from the North Cape to Poverty Bay, but is most abundant on the outlying islands off the north-eastern coast of the North Island. In a wild state it is never found far from the sea, and it does not extend southwards beyond the boundaries of the Auckland Provincial District. It is easily distinguished from all the other species by its strict erect habit, narrow-obovate coriaceous tomentose leaves, and large capsules.

Pittosporum crassifolium is now frequently cultivated as a hedge-plant, and is of great value for the formation of shelter-belts near the sea. It will bear exposure to the strongest winds, and may be seen growing naturally in places where it must be subject to a considerable amount of driving spray. In addition to the above, it is of easy cultivation and comparatively rapid in its growth.

PLATE 16. *Pittosporum crassifolium*, drawn from specimens (male and female) collected in the vicinity of Auckland. Fig. 1, male flower; 2, stamens and pistil; 3, abortive pistil; 4, section of the same; 5, female flower; 6, pistil, with rudimentary stamens; 7, section of ovary near the base; 8, section of ovary near the apex; 9, ripe fruit and section of same (natural size); 10, seed (natural size); 11, section of seed; 12, embryo. (All enlarged except 9 and 10.)





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PITTOSPORUM KIRKII, Hook. f.

PLATE 17.—PITTOSPORUM KIRKII.

FAMILY PITTOSPORACEÆ.]

[GENUS PITTOSPORUM, BANKS.

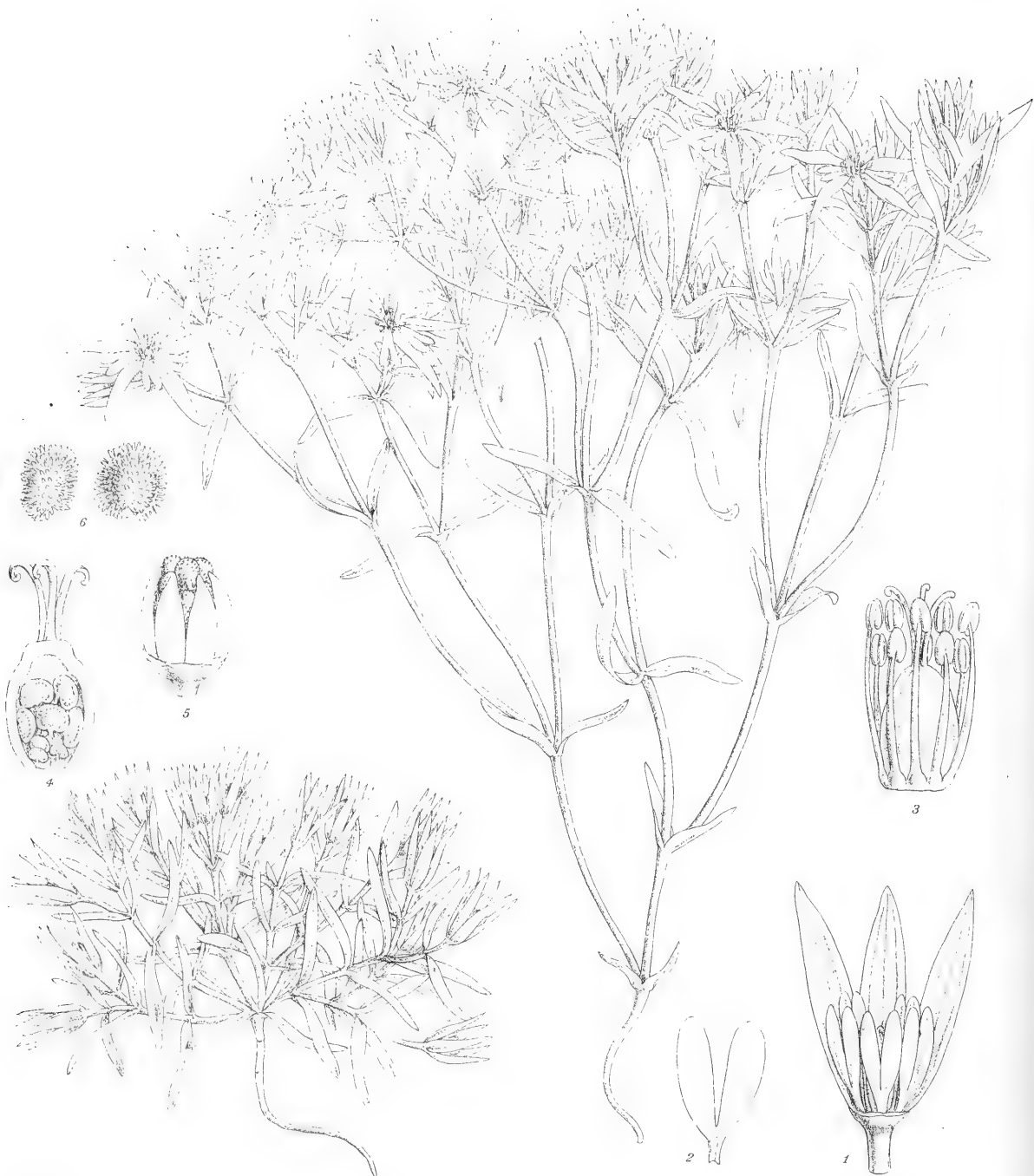
Pittosporum Kirkii, Hook. f. ex T. Kirk in *Trans. N.Z. Inst.* ii (1870), 92; *Cheesem. Man. N.Z. Fl.* 59.

Pittosporum Kirkii is one of the most distinct species of the genus found in New Zealand. It is worthily named in honour of its discoverer, the late Mr. T. Kirk, who first obtained it during a botanical exploration of the Great Barrier Island made in the year 1867. Further research has shown that it occurs sparingly in densely wooded hilly districts from Maungataniwha, in Mongonui County, southwards to the Mount Egmont Ranges on the west, and the Bay of Plenty on the east. Its altitudinal range is from 500 ft. to nearly 3,000 ft., but it is most plentiful at an elevation of about 2,000 ft.

Like *P. cornifolium*, it is frequently epiphytic on the trunks and branches of the rata (*Metrosideros robusta*) and other large forest-trees, but it is often rupestral as well, and may also be seen forming part of the ordinary undergrowth of the forest. On the Maungataniwha Ranges I observed many tall and well-grown specimens quite 10 ft. to 12 ft. high, but as a rule it seldom exceeds 6 ft. in height.

Its relationships are somewhat obscure. While agreeing in some respects with *P. cornifolium*, it differs altogether in the much more coriaceous habit, longer linear-obovate leaves, yellow flowers, and particularly in the very large narrow-oblong 2-valved capsules. I do not know any foreign species that can be said to be closely allied.

PLATE 17. *Pittosporum Kirkii*, male, female, and fruiting specimens, collected on the Cape Colville Peninsula, at an altitude of 1,700 ft. Fig. 1, male flower; 2, stamens and rudimentary pistil; 3, single stamen; 4, female flower; 5, pistil, with rudimentary stamens; 6, longitudinal section of pistil; 7, cross-section of pistil. (All enlarged.)



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

STELLARIA ROUGHII, Hook. f.

PLATE 18.—STELLARIA ROUGHII.

FAMILY CARYOPHYLLACEÆ.]

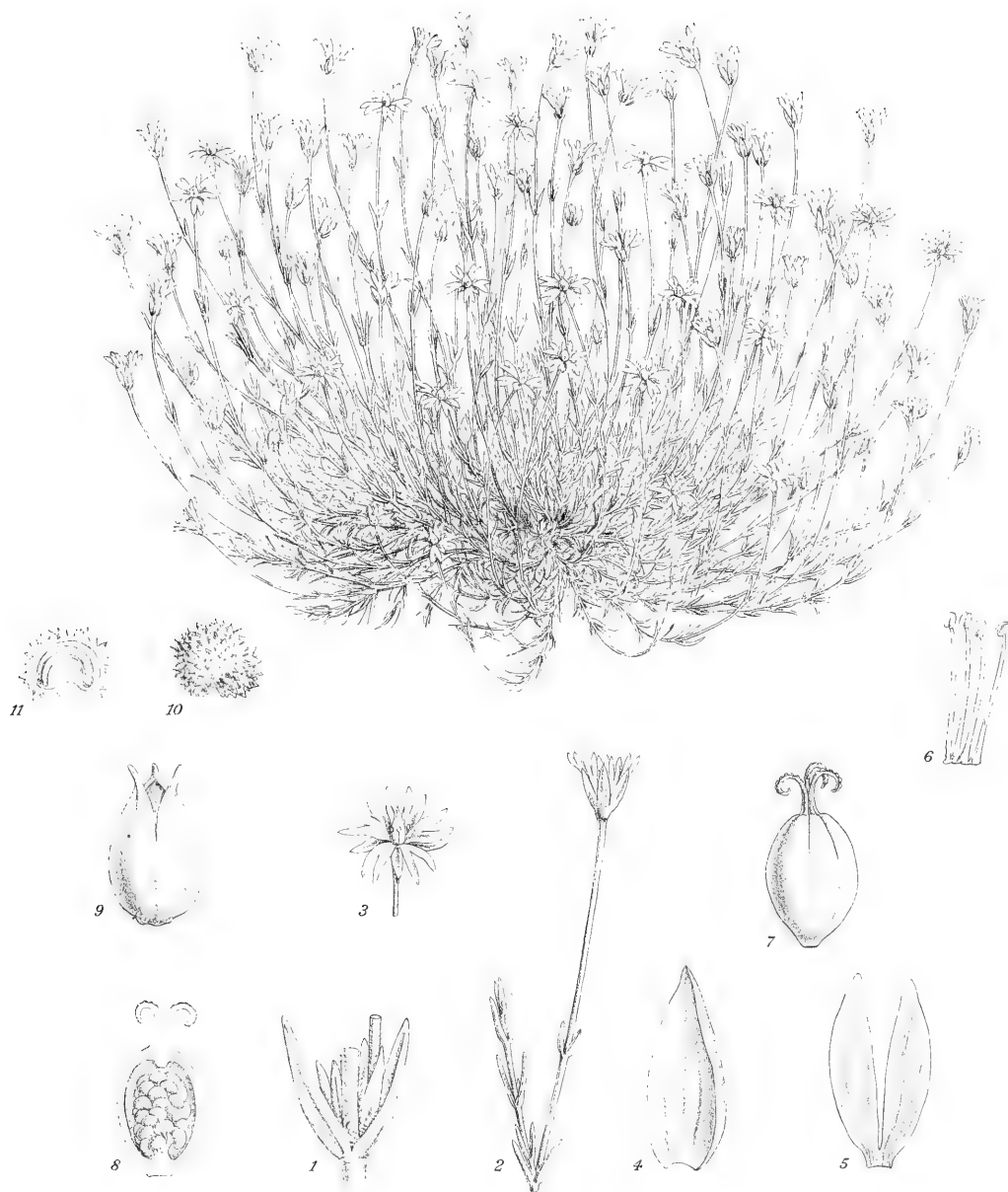
[GENUS STELLARIA, LINN.]

Stellaria Roughii, Hook. f. *Handb. N.Z. Fl.* 23; *Cheesem. Man. N.Z. Fl.* 64.

The shingle-slopes so well developed on the sides of the higher mountains of New Zealand support a scanty vegetation composed of plants with very diversified relationships, but all agreeing in their comparatively small size, and in their possession of roots or rhizomes apparently altogether out of proportion to their short stems and depressed habit. Of these plants, *Stellaria Roughii*, the subject of this plate, may be considered to be a good typical example. It was first discovered by Captain Rough on Dun Mountain, near Nelson, but was soon observed by Sir D. Monro, Mr. W. T. L. Travers, and other botanists on most of the higher mountains of the Nelson Provincial District. It has also been gathered by myself in the Upper Clarence Valley, and on the mountains near Lake Tennyson, from whence it stretches southwards to Mount Torlesse and the basin of the Waimakariri. I am not aware of any locality in southern Canterbury or Otago; but it has been lately discovered by Mr. Crosby Smith on the Takitimo Ranges, Southland. Its altitudinal range is from 2,500 ft. to 6,000 ft.

Stellaria Roughii is a most distinct species. It has a very peculiar fleshy glaucous habit, and is remarkable for its large green flowers, the sepals being unusually long and consequently concealing the short white petals. Another noteworthy character is the long papillæ which cover the seeds. It is altogether unlike any of the remaining New Zealand species, and I am not aware that it has any near allies in Australia or South America.

PLATE 18. *Stellaria Roughii*, drawn from specimens collected on the Black Range, Canterbury Alps, at an elevation of 3,500 ft. Fig. 1, flower, with two of the sepals removed to show the proportionately small petals; 2, a single petal; 3, stamens and ovary; 4, section of ovary; 5, ripe capsule, showing dehiscence; 6, seeds, showing the curious linear papillæ. (All enlarged.)



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

STELLARIA GRACILENTA, Hook. f.

PLATE 19.—STELLARIA GRACILENTA.

FAMILY CARYOPHYLLACEÆ.]

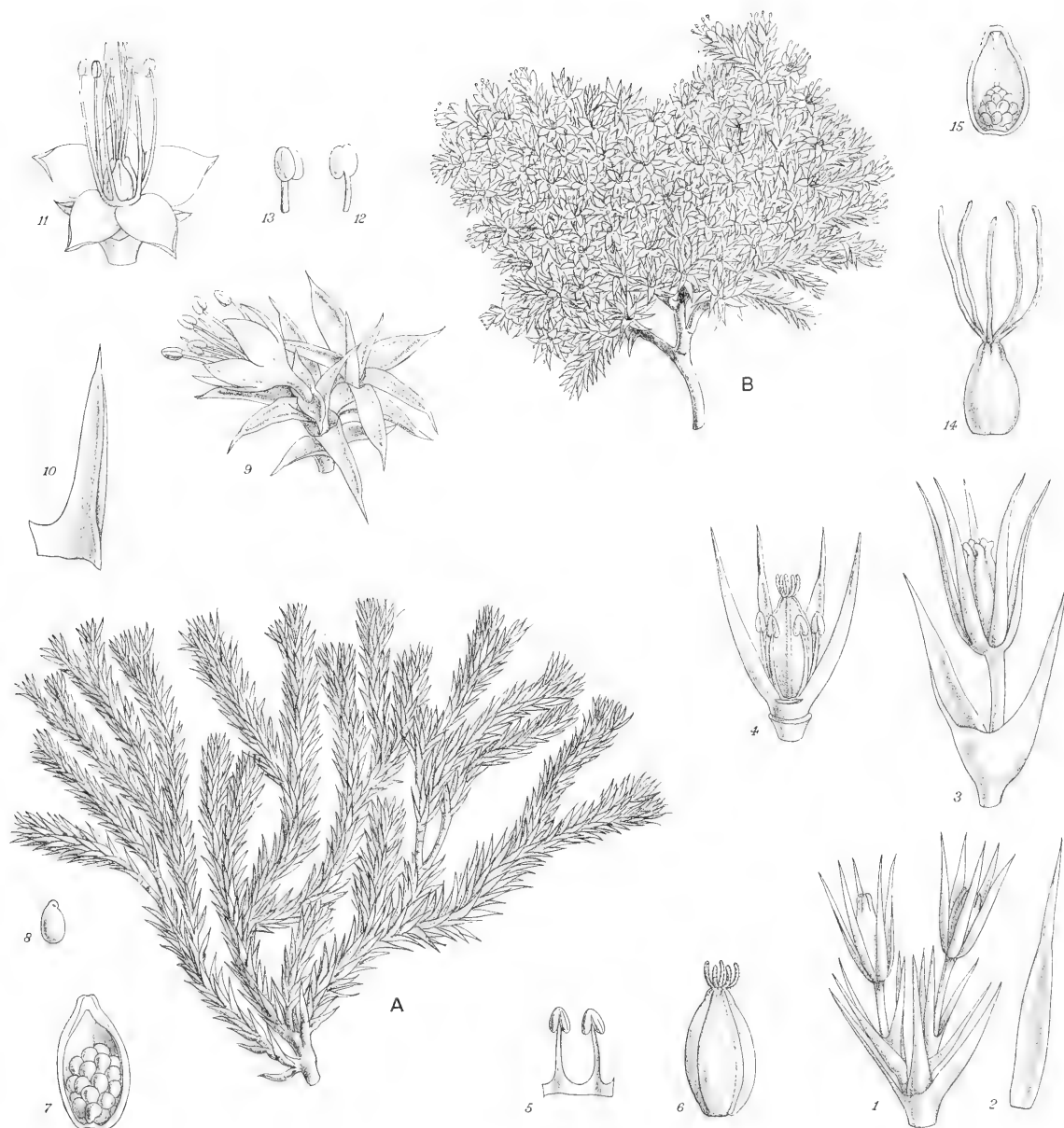
[GENUS STELLARIA, LINN.

Stellaria gracilentia, Hook. f. *Fl. Nov. Zel.* ii, 326 ; *Cheesem. Man. N.Z. Fl.* 65.

For the discovery of this plant we are indebted to Mr. J. C. Bidwill, who was not only the first explorer of Tongariro and Ngauruhoe, in the centre of the North Island, but who was also the first botanist to visit several of the higher mountains of Nelson. The collections which he formed thereon were forwarded to Sir W. J. Hooker, at Kew, and contained many novelties, among which was the plant now figured. It was next gathered by Sir David Monro, who did so much to elucidate the botany of the northern part of the South Island, and has since been found to be generally distributed in mountain districts from Nelson to the south of Otago. It has not yet been recorded from either the North Island or Stewart Island, although its presence in both might have been anticipated. It is usually found in stony or gravelly places at an elevation of about 3,000 ft., but ascends as high as 5,000 ft., and descends to sea-level at the mouth of the Waitaki and Rakaia Rivers, and possibly in other localities.

Stellaria gracilentia is easily recognized by its rigid and wiry habit, linear-subulate leaves, and long peduncles. It is often closely cropped by sheep, and then forms a close rigid turf quite unlike the lax open habit which it usually possesses. During recent years it has increased considerably in several mountain districts in South Canterbury and Otago.

PLATE 19. *Stellaria gracilentia*, drawn from specimens collected on Mount Peel, Nelson, at an altitude of 4,000 ft. Fig. 1, portion of branch, showing leaves ($\times 6$); 2, peduncle, with bracts and a solitary terminal flower ($\times 2$); 3, flower ($\times 2$); 4, sepal ($\times 8$); 5, petal ($\times 8$); 6, stamens ($\times 8$); 7, ovary ($\times 10$); 8, section of ovary, showing ovules ($\times 10$); 9, ripe capsule ($\times 8$); 10, seed ($\times 8$); 11, section of seed, showing embryo ($\times 8$).



A. COLOBANTHUS ACICULARIS, Hook. f. 1-8.
 B. COLOBANTHUS CANALICULATUS, T. Kirk. 9-15.

PLATE 20. — COLOBANTHUS ACICULARIS AND
COLOBANTHUS CANALICULATUS.

FAMILY CARYOPHYLLACEÆ.]

[GENUS COLOBANTHUS, BARTL.

Colobanthus acicularis, Hook. f. *Handb. N.Z. Fl.* 25; *Cheesem. Man. N.Z. Fl.* 69.

Colobanthus canaliculatus, T. Kirk in *Trans. N.Z. Inst.* xxvii (1895), 357; *Cheesem. Man. N.Z. Fl.* 69.

The genus *Colobanthus* possesses considerable interest for New Zealand botanists, on account of its peculiar southern distribution, the species being confined to New Zealand, Victoria and Tasmania, the Kerguelen and South Georgia group of islands, and Fuegia and Andine South America. It thus constitutes one of those genera sometimes styled "antarctic," in the belief that they are the remnants of a flora that once occupied the now barren Antarctic continent, or inhabited a northern extension of it, which, it is supposed, may have stretched as far as New Zealand.

Colobanthus acicularis, the first of the two species illustrated in this plate, was originally discovered by Mr. W. T. L. Travers in dry rocky places in the Wairau Gorge, in the centre of the Nelson Provincial District, and was quickly found to be plentiful in similar stations throughout the South Island, its altitudinal range extending from 1,500 ft. to nearly 6,000 ft. Although varying greatly in size, its other characters are for the most part fairly constant, so that in most cases it can be recognized at a glance. The robust stem and branches, the long leaves with remarkably long acicular points, the nearly sessile flowers, and the long sepals much exceeding the capsule, are peculiarities which readily distinguish it from all the other species.

Colobanthus canaliculatus was originally described by Mr. Kirk from specimens collected by Mr. John Buchanan in some locality in Central Otago. In this district it has not since been refound, although repeatedly searched for during the last ten years. In 1892 I found it to be abundant on the debris of limestone rocks on the northern side of Mount Owen, Nelson, at an altitude of 4,000 ft., and it has since been observed in the same locality by Mr. W. Townson. So far as I am aware, this is the only station for the plant of which we possess precise knowledge. Apparently it is a very distinct species, well marked by the short spreading chaffy leaves, which are either acute or very shortly acicular, by the short stout lateral peduncles, and by the broadly ovate sepals.

PLATE 20A. *Colobanthus acicularis*, drawn from specimens collected on Jollie's Pass, Hanmer district, at an altitude of 3,000 ft. Fig. 1, summit of branch, with flowers ($\times 4$); 2, leaf, showing the long acicular points ($\times 8$); 3, single flower, with bracts ($\times 6$); 4, single flower, with one sepal removed ($\times 6$); 5, two stamens ($\times 6$); 6, ovary ($\times 6$); 7, section of ovary, showing seeds ($\times 6$); 8, seed ($\times 8$).

PLATE 20B. *Colobanthus canaliculatus*, drawn from specimens collected on the northern face of Mount Owen, Nelson, at an altitude of 4,000 ft. Fig. 9, summit of branch, with flower ($\times 4$); 10, leaf, showing the short acicular tip ($\times 8$); 11, flower, showing the broadly ovate sepals ($\times 6$); 12 and 13, anthers, front and back view (enlarged); 14, ovary (enlarged); 15, section of ovary (enlarged).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

PLAGIANTHUS CYMOSUS, T. Kirk.

PLATE 21.—PLAGIANTHUS CYMOSUS.

FAMILY MALVACEÆ.]

[GENUS PLAGIANTHUS, FORST.

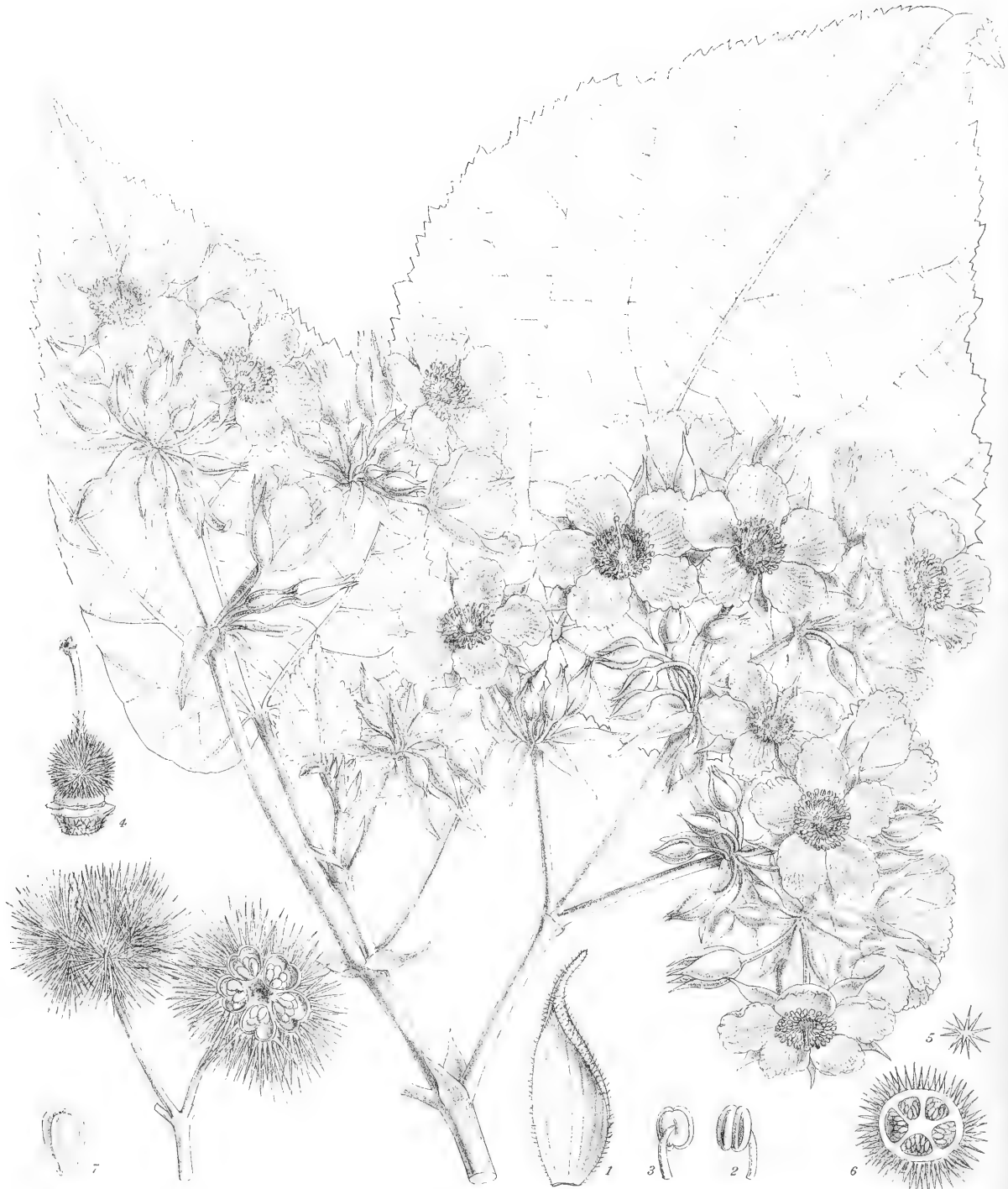
[*Plagianthus cymosus*, T. Kirk. *Students' Fl.* 70; *Cheesem. Man. N.Z. Fl.* 77.

This is a very curious and remarkable plant, the life-history of which deserves to be worked out with more care than has yet been given to it. It was first collected in 1887 by Mr. G. M. Thomson in the vicinity of Dunedin, but I believe that a single female was all that was found. Mr. Thomson considered it to be a form of *P. betulinus* and distributed specimens of it under that name. For several years no additional locality was discovered, but it was at length gathered by Mr. J. D. Enys in the Upper Waimakariri Valley, at an altitude of 2,800 ft.; but, unfortunately, I have no information as to the conditions under which it was found. In 1903, or thereabouts, Mr. R. H. Matthews collected it near Kaitaia, Mongonui County, at first only observing a single male plant, but I understand that several specimens of both sexes have since been noted. In 1906 the late Mr. H. J. Matthews and Mr. J. H. Macmahon gathered it in the lower part of the Pelorus Valley, Marlborough, where it grows in great profusion, intermixed with *P. betulinus* and *P. divaricatus*. Lastly, in 1908 Dr. Cockayne recorded its occurrence on the Port Hills, near Lyttelton.

P. cymosus can be distinguished from the other species of *Plagianthus* found in New Zealand by the linear-oblong toothed leaves and few-flowered cymes. If its characters are carefully compared with those of *P. betulinus* and *P. divaricatus* it will be recognized that it stands nearly half-way between the two species. The suspicion of a hybrid origin at once arises, and it must be confessed that such an assumption would go far towards explaining the peculiar rarity of the plant in some of its localities. On the other hand, fruiting specimens sent to me by Mr. H. J. Matthews from the Pelorus Valley have well-developed and well-ripened seeds with a fully developed embryo, and shows no signs of the impaired fertility frequently seen in hybrids.

The late Mr. H. J. Matthews suggested to me that *P. cymosus* might possibly be an arrested juvenile form of *P. betulinus*. But neither in habit nor foliage does it match the common juvenile state of *P. betulinus*, which has a much more straggling mode of growth and broader, shorter leaves. It is much to be desired that some botanist residing in a favourable locality would devote a little time and study to this puzzling plant.

PLATE 21. *Plagianthus cymosus*, drawn from specimens collected by Mr. H. J. Matthews in the lower part of the Pelorus Valley, Marlborough. Fig. 1, part of inflorescence ($\times 4$); 2, flower laid open (enlarged); 3 and 4, anthers, back and front view (enlarged); 5, pistil (enlarged); 6, section of same (enlarged); 7, fruit ($\times 4$); 8, seed ($\times 4$); 9, seed, with testa removed ($\times 5$); 10 and 11, embryo (enlarged).



M. Smith del.
J.N. Pritch lch.

West, Newman imp.

ENTELEA ARBORESCENS, R. Br.

PLATE 22.—ENTELEA ARBORESCENS.

(THE WHAU.)

FAMILY TILIACEÆ.]

[GENUS ENTELEA, R. BR.

Entelea arborescens, R. Br. in *Bot. Mag.* t. 2480 ; *Cheesem. Man. N.Z. Fl.* 82.

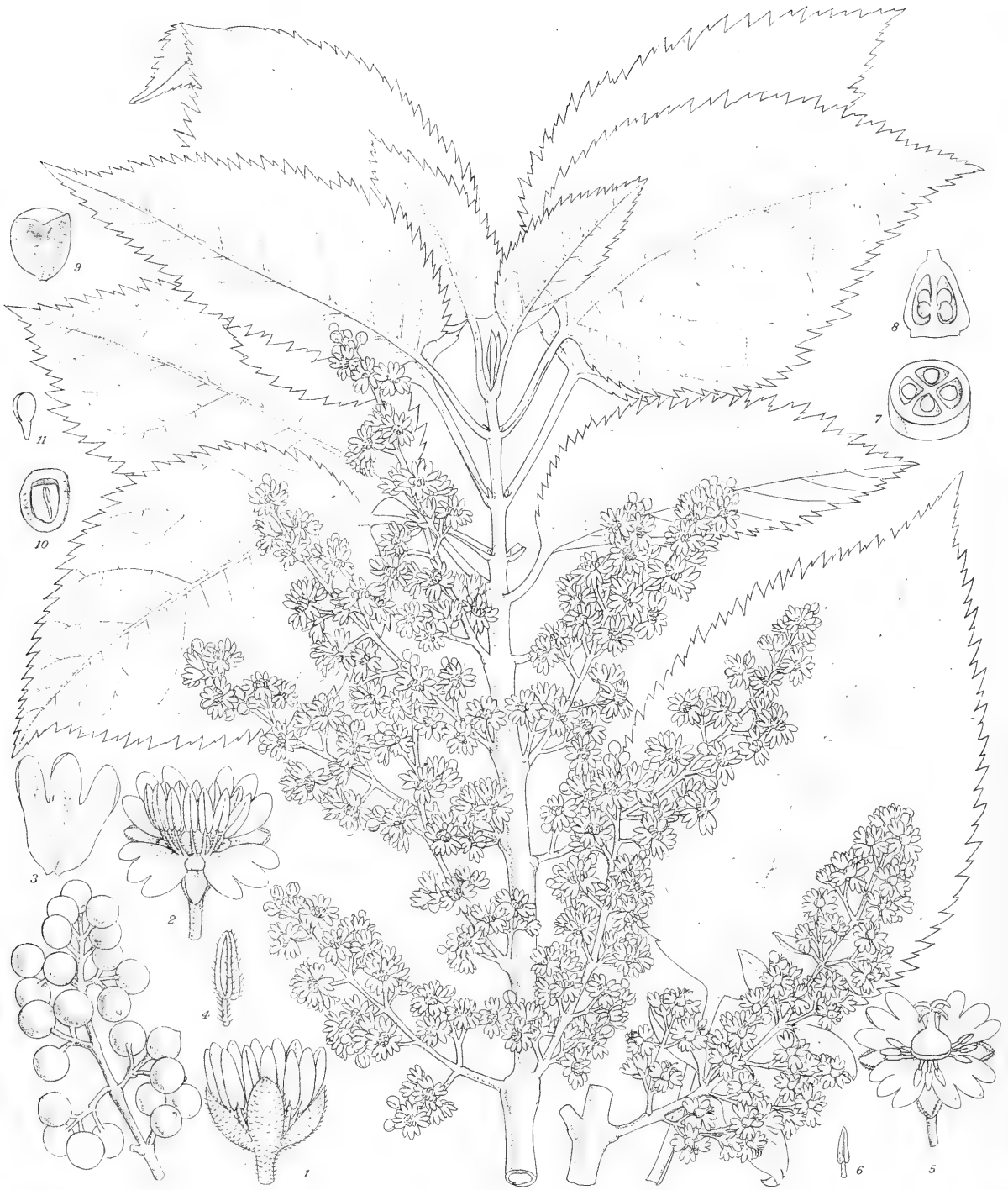
This is a familiar plant in the north part of the North Island, and is commonly known either by its Maori name of whau, or by that of cork-wood, often applied to it by European settlers. It was first discovered in 1769 at Anaura Bay, in the East Cape district, by Sir Joseph Banks and Dr. Solander, who accompanied Cook during his first visit to New Zealand. Dr. Solander recognized the family to which it belonged, and gave it the MS. name of *Corchorus sloaneoides*. But that name was never actually published; and in 1824, after the lapse of more than fifty years, it was described and figured by Robert Brown in the *Botanical Magazine* under its present name.

So far as is at present known, the genus *Entelea* is limited to the New Zealand plant. But it is very closely allied to the South African *Sparmannia*, from which it only differs in the whole of the stamens being fertile, whereas the outer ones are sterile in *Sparmannia*. The species is mainly coastal in its distribution, and is most plentiful between the North Cape and Tauranga on the eastern side of the North Island, and Raglan on the west. It occurs sporadically southwards to Wellington, and then very sparingly from Cape Farewell to Queen Charlotte Sound, on the southern shore of Cook Strait. Usually it is found at the base of cliffs near the sea, or in sheltered gullies on sandy soil, but occasionally may be seen on the margin of the forest in warm alluvial valleys some little distance inland. As it is greedily eaten by cattle and horses, it is fast becoming scarce on the mainland, but is still plentiful on many of the outlying islands on the north-eastern coast of the North Island. On some of these it exhibits very great luxuriance, as, for instance, on Cuvier Island, where some years ago I measured leaves with petioles 2 ft. long, and with a blade 1 ft. 6 in. in diameter.

Entelea arborescens is remarkable for the lightness of its wood, which when well dried does not much exceed half the weight of a piece of cork of the same size. This induced the Maoris to employ it for the floats of their fishing-nets and for the framework of small rafts, as was observed many years ago by Cook and other early voyagers.

The fine bold foliage, which has almost a tropical aspect, and the handsome large white flowers, followed by conspicuous spiny capsules, give the plant a very handsome and attractive appearance; and as it is of quick growth and very easy cultivation it is gradually becoming plentiful in gardens in the North Island. It can be raised either from seed or from cuttings of the ripened wood.

PLATE 22. *Entelea arborescens*, drawn from specimens collected on Otatau Island, in the Hauraki Gulf. Fig. 1, sepal ($\times 2$); 2 and 3, anthers ($\times 3$); 4, ovary ($\times 2$); 5, stellate hair (enlarged); 6, section of ovary ($\times 3$); 7, seed (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp

ARISTOTELIA RACEMOSA, Hook. f.

PLATE 23.—ARISTOTELIA RACEMOSA.

(THE MAKOMAKO OR WINEBERRY.)

FAMILY TILIACEÆ.]

[GENUS ARISTOTELIA, L'HER.

Aristotelia racemosa, Hook. *j. Fl. Nov. Zel.* i, 33; *Cheesem. Man. N.Z. Fl.* 83.

Not many New Zealand trees have a wider distribution than the subject of this plate, which is found in lowland forests from the North Cape to the south of Stewart Island, and is common in most soils and situations from sea-level to an altitude of considerably over 2,000 ft. Like numerous other New Zealand plants, it was discovered by Sir Joseph Banks and Dr. Solander during Cook's first visit. Dr. Solander, in his manuscript "*Primitiæ Floræ Novæ Zelandiæ*," gave it the name of *Triphalia rubicunda*; but, as already mentioned in this work, his names were never actually published, and consequently have no standing in systematic botany. In 1776 the two Forsters published it in their "*Characteres Generum*" under the name of *Dicera serrata*, but with an altogether insufficient diagnosis; and George Forster's later description in the "*Prodromus*" is equally unsatisfactory. In 1832, however, A. Richard, in the "*Botany of the Voyage of the 'Astrolabe,'*" published a full description of the plant from Forster's manuscripts, which leaves no doubt as to the identity of the species. A. Cunningham, in 1840, referred it to *Friesia*, giving it the new specific name of *racemosa*; and Sir J. D. Hooker, who in the "*Floræ Novæ Zelandiæ*" first placed the plant in its correct genus *Aristotelia*, unfortunately used Cunningham's name. This is much to be regretted, as Forster's appellation was the one entitled to priority. Now, after the lapse of sixty years, during which the present name has been used without any interruption, I hesitate to make a change which will inevitably cause much confusion and from which little advantage can be derived.

Aristotelia racemosa is usually the first tree to reappear when the forest has been cut down or burnt, and thus often forms large groves to the exclusion of other species, or fringes for long distances the sides of roads cut through forest districts. It is a slender graceful tree, handsome at all times; but in spring, when the young leaves have put on their varied hues of purple and green, and when the rosy tints of the flowers are everywhere conspicuous, it often presents a charming and attractive appearance. It does well in cultivation, but requires to be sheltered from strong winds. The only economic use to which the timber has been applied is for making charcoal for the manufacture of gunpowder.

Aristotelia is one of those genera which connect the floras of South America, Australia and New Zealand, and the Melanesian islands. Two species are found in South America, three in New Zealand, three in Australia, one in the New Hebrides, and one in New Guinea. Australia and eastern Polynesia thus appear to be the centre of distribution of the genus, but the existence of the two isolated species in South America is difficult to account for.

PLATE 23. *Aristotelia racemosa*, drawn from specimens collected on the Waitakerei Range, near Auckland. Figs. 1 and 2, male flowers ($\times 5$); 3, petal, showing the three lobes ($\times 8$); 4, stamen ($\times 7$); 5, female flower ($\times 5$); 6, rudimentary stamen ($\times 8$); 7 and 8, transverse and longitudinal section of ovary, showing the position and attachment of the ovules ($\times 8$); 9 and 10, ripe seed and longitudinal section of the same (enlarged); 11, embryo (enlarged).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

ELAEOCARPUS DENTATUS, Vahl.

PLATE 24.—ELÆOCARPUS DENTATUS.

(THE HINAU.)

FAMILY TILIACEÆ.]

[GENUS ELÆOCARPUS, LINN.

Elæocarpus dentatus, Vahl, *Symb. Bot.* iii, 66; *Cheesem. Man. N.Z. Fl.* 85.

A well-known and widely distributed tree, not uncommon in forest districts between the North Cape and the south-east of Otago. Like the preceding species, it was first collected by Sir Joseph Banks and Dr. Solander, and in their manuscripts was correctly referred to the genus *Elæocarpus*; but, as the specific name they applied has never been published, there is little use in quoting it here. The two Forsters, who gathered it in Queen Charlotte Sound, were the first to make it known to the botanical world, publishing it, with a very insufficient diagnosis, under the name of *Dicera dentata*. As in the case of *Aristolelia racemosa*, which was referred to the same genus, a more complete description, taken from Forster's manuscripts, was given by A. Richard in the "Botany of the Voyage of the 'Astrolabe.'" Allan Cunningham, in his "Precursor," rightly included the plant in *Elæocarpus*, but instead of using Forster's specific name, which was perfectly well known to him, coined a new one of his own by employing the Maori name hinau. This inexcusable action was rectified by Sir J. D. Hooker in the "Handbook" by the adoption of the combination *Elæocarpus dentatus*, by which it has since been generally known.

The hinau, as it is commonly called by both Europeans and Maoris, is a handsome tree when in bloom, from the abundance of its white pendulous flowers. The timber is durable, and might be employed for fencing posts and rails, and probably for other purposes, but so far it has been much neglected. A figured variety, however, has lately been used with good results for panelling and furniture.

In olden times the berries of the hinau formed no small proportion of the vegetable food of the Maori; but as they are decidedly unpalatable in the fresh state some considerable amount of treatment and after-cooking was required to satisfy the taste of a Maori epicure. According to Mr. Colenso and Mr. Elsdon Best, who are the chief authorities on the subject, two ways of preparing the fruit were commonly followed. In the first, the berries were soaked in water for some time, and then well rubbed in the hands, the kernels, skin, and bits of stalk being carefully strained out, leaving behind a coarse greyish-white meal. The other plan was to pound the berries with a wooden or stone beater, the pounded material being sifted through a coarse sieve, which retained the kernels, &c. In both cases the prepared meal was mixed with water into large cakes or pudding-like masses, which were cooked in a *hangi* or steam-oven, a cake of 20 lb. or 30 lb. weight taking quite two days to bake in a proper manner. This hinau-bread had a dark greyish-brown colour, much darker, in fact, than that of rye-bread, but it was greatly liked by the Maoris. A well-known Maori proverb says, "When you awaken me from sleep, let it be for the purpose of eating hinau-meal."

A further use made of the hinau was for dyeing flax-fibre to be used in the manufacture of cloaks and other articles. In this case the bark of the tree was pounded into shreds, which were then placed at the bottom of a wooden bowl. Above this was spread a layer of the fibre to be dyed, then another layer of the bark, and so on. The bowl was then filled with water and left for twelve or sixteen hours, after which the fibre was taken out and steeped for twenty-four hours in the blackish mud of certain swamps, which intensified and fixed the dye. The fibre was then washed and dried, after which it was ready for the operations of the weaver.

PLATE 24. *Elæocarpus dentatus*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, portion of back of leaf, showing the indumentum of fine silky appressed hairs, and the curious "domatia" in the axils made by the main veins with the midrib (enlarged); 2, flower ($\times 3$); 3, flower, with the petals removed, showing the torus and the stamens seated thereon ($\times 3$); 4, petal ($\times 3$); 5 and 6, anthers, showing dehiscence by a terminal slit ($\times 8$); 7, pistil (enlarged); 8 and 9, transverse and longitudinal section of ovary (enlarged); 10, section of fruit ($\times 2$); 11, embryo ($\times 5$).

THE HISTORY OF THE UNITED STATES

OF AMERICA

FROM 1492 TO 1876

BY HENRY ADAMS

The history of the United States is a story of the growth of a nation from a small colony of English settlers to a great republic. It is a story of the struggle for freedom and independence, of the fight for the rights of the individual against the power of the state, and of the development of a new form of government. The story is one of the most important in the world, for it is the story of the nation that has become the most powerful and influential in the world.

The story begins with the first English settlers in 1492, who came to America in search of a new home. They found a land of great beauty and fertility, but they also found a land of great danger. The native Americans were a powerful and warlike people, and the settlers had to fight for their lives.

Over the years, the settlers grew in number and in power. They fought for their rights and won. They established a new form of government, and they became a nation. The story of the United States is a story of the growth of a nation from a small colony to a great republic.

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M. Smith del.
J.N. Fitch lith.

West, Newman imp.

GERANIUM TRAVERSII, Hook. f.

PLATE. 25—GERANIUM TRAVERSII.

FAMILY GERANIACEÆ.]

[GENUS GERANIUM, LINN.

Geranium Traversii, Hook. f. *Handb. N.Z. Fl.* 726; *Cheesem. Man. N.Z. Fl.* 89.

This handsome species was discovered by Mr. H. H. Travers in the Chatham Islands during a botanical exploration of the group made in the year 1863-64, and has since been gathered or observed by all botanists who have examined the vegetation of the islands, but has not yet been collected on any part of the mainland of New Zealand. Mr. Travers's specimens were placed in the hands of the late Baron Mueller, and were referred by him to the widely distributed *G. dissectum*, which in some of its forms is found in most parts of the north and south Temperate Zones. But this disposition of the Chatham Islands plant has found no followers, as it evidently differs from all the varieties of *G. dissectum* in the silvery-hoary pubescence, 1-flowered peduncles, large flowers, and minutely reticulated seeds. It was accordingly described as a new species by Sir J. D. Hooker in the second part of the "Handbook," under the name which it now bears.

Geranium Traversii appears to be abundant on maritime rocks on all parts of the coast of the Chatham Islands, and is also found in rocky situations some little distance from the sea. It succeeds well in cultivation, and is now established in several New Zealand gardens. In its usual state the flowers are white; but a pink-flowered variety has been found in a wild state, and appears to retain its characters under cultivation.

It is a remarkable fact that not less than thirty species of flowering-plants are confined to the Chatham Islands, the total flora of which, including both the phanerogams and vascular cryptogams, does not exceed 220 species. The percentage of endemic species is thus rather over 14 per cent. A ratio so large as this cannot be said to offer much support to the theory so often advanced of the former connection of the islands with New Zealand during Pliocene times.

PLATE 25. *Geranium Traversii*, drawn from specimens cultivated in the garden of the late Mr. H. J. Matthews, Dunedin. Fig. 1, flower, with 2 of the sepals and all the petals removed ($\times 3$); 2, petal ($\times 2$); 3 and 4, stamens ($\times 8$); 5, pistil ($\times 8$); 6, seed (enlarged).



M. Smith del.
J.N. Fitch lith

West, Newman imp.

PHEBALIUM NUDUM, Hook.

PLATE 26.—PHEBALIUM NUDUM.

(THE MAIREHAU.)

FAMILY RUTACEÆ.]

[GENUS PHEBALIUM, VENT.

Phebalium nudum, Hook. Ic. Plant. t. 568; Cheesem. Man. N.Z. Fl. 93.

Not many of the smaller shrubs of New Zealand are more deserving of notice than the subject of this plate. The slender graceful habit, the pleasant aromatic smell of the leaves, and the abundant corymbs of fragrant white flowers combine to render it a most pleasing and attractive plant. It is one of the numerous species added to the New Zealand flora by Mr. Colenso, who in 1838 collected it at Owai, near Whangaroa. Mr. Colenso's specimens were forwarded to his friend Allan Cunningham, who, however, did not live to examine them. Further examples were sent to Sir W. J. Hooker, who figured and described them in the "Icones Plantarum" under the present name.

Phebalium nudum is confined to the North Island, and is found in hilly forests from Kaitaia (Mongonui County) southwards to the Upper Thames Valley. It frequently occurs in kauri forests, mixed with *Alseuosmia macrophylla*, *Senecio Kirkii*, *Dracophyllum latifolium*, *Leucopogon fasciculatus*, *Astelia trinervia*, *Gahnia xanthocarpa*, &c. It also frequents dry rocky or clayey slopes in mixed forests, and is particularly plentiful in such stations in the Great Barrier Island, and certain portions of the Cape Colville Peninsula. It descends to sea-level in several localities, but is generally seen between 250 ft. and 1,000 ft. altitude. In the Thames district and near Hokianga it ascends to an elevation of quite 2,500 ft.

With the exception of the present species, the genus is confined to Australia, where about thirty species are known. According to Sir J. D. Hooker, the New Zealand plant is very closely allied to the Queensland *P. elatius*, "but the flowers are larger, the petals longer, the corymbs more flattened, and the leaves taper less to the base; they may prove to be local forms of the one species."

The fragrance of the flowers, and the aromatic nature of the whole plant, have given rise to the belief that a perfume of some value might be obtained from it. Some years ago an attempt was made to investigate the matter, but I understand that the results were not considered sufficiently favourable.

PLATE 26. *Phebalium nudum*, drawn from specimens collected on the Little Barrier Island by Miss Shakespear. Fig. 1, portion of leaf, showing oil-glands and the irregularly crenate margin (enlarged); 2, flower-bud ($\times 4$); 3, flower ($\times 4$); 4 and 5, anthers ($\times 5$); 6, 5-lobed pistil ($\times 6$); 7 and 8, transverse and longitudinal sections of pistil ($\times 8$); 9, fruit, showing two fully developed cocci and 3 rudimentary ones ($\times 4$); 10, endocarp removed from the capsule (or coccus) ($\times 4$); 11, the same spread open, showing the seed ($\times 4$); 12, the same, empty ($\times 4$); 13, section of seed ($\times 4$); 14, embryo ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

MELICOPE TERNATA, Forst.

PLATE 27.—MELICOPE TERNATA.

(WHARANGI.)

FAMILY RUTACEÆ.]

[GENUS MELICOPE, FORST.

Melicope ternata, Forst. Char. Gen. 56 ; Cheesem. Man. N.Z. Fl. 94.

Melicope ternata is a common tree in lowland districts in the northern part of New Zealand, ranging from the Kermadec Islands and the Three Kings Islands southwards to Nelson and Marlborough. It is generally seen near the coast, and, so far as I am aware, does not ascend to a greater elevation than about 1,000 ft. It was first collected by Sir Joseph Banks and Dr. Solander at Tolaga Bay, in October, 1769, during Cook's first visit to New Zealand. In Solander's manuscripts the name of *Entoganum lævigatum* was applied to it, but this was not actually published until 1788, when it was adopted by Gaertner in his work "De Fructibus et Seminibus Plantarum." In the meantime, however, it had been described by Forster in his "Characteres Generum" under the name it now bears.

When growing in the open *Melicope ternata* forms a closely branched round-topped shrub; but when mixed with other trees it will attain a height of 20 ft. or 25 ft., with a trunk 9 in. in diameter or even more. The leaves, young branchlets, and even the calyces and petals, are plentifully studded with pellucid oil-glands, so that the whole plant is aromatic when bruised or roughly handled. The wood is pale and satiny, and has been employed for inlaying, but its small size will preclude any extensive use.

Systematists differ as to the limitation of *Melicope*. Hooker and Bentham, in the "Genera Plantarum," unite with it the Sandwich Island and Polynesian *Pelea*, but recent workers keep that genus as distinct. On the other hand, the Malayan *Tetractoma* is now usually merged with *Melicope*. If the views expressed by Engler in the "Pflanzenfamilien" are followed, then *Melicope*, with about thirty species, is mainly Australian and Malayan, two or three species being found as far north as the Philippine Islands.

PLATE 27. *Melicope ternata*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, part of leaf, showing the numerous oil-glands (slightly enlarged); 2 and 3, flowers, showing both sepals and petals thickly studded with oil-glands ($\times 4$); 4 and 5, stamens, front and back view (enlarged); 6, pistil, showing the almost separable lobes of the ovary, surrounded at the base by an annular disc ($\times 8$); 7 and 8, transverse and longitudinal sections of ovary (enlarged); 9, ripe fruit, consisting of 4 free cocci dehiscing along the inner suture (enlarged); 10, seed (enlarged); 11, section of same (enlarged).



M. Smith del.
J. N. Fitch lith

West, Newman imp.

POMADERRIS EDGERLEYI, Hook. f.

PLATE 28.—POMADERRIS EDGERLEYI.

FAMILY RHAMNACEÆ.]

[GENUS POMADERRIS, LABILL.

Pomaderris Edgerleyi, Hook. f. *Handb. N.Z. Fl.* 43; *Cheesem. Man. N.Z. Fl.* 100.

The first-known specimens of this plant were gathered by Mr. Edgerley about the year 1850, and were communicated to Sir W. J. Hooker at Kew. As neither flowers nor fruit were obtained the genus could not be positively determined; and hence Sir J. D. Hooker, when preparing the "*Flora Novæ Zelandiæ*," was unable to do more than furnish a very brief description of the plant as a possible *Pomaderris* collected by Mr. Edgerley on "lofty hills in lat. 36°, about twenty miles from the coast." Shortly afterwards it was gathered by Dr. Sinclair on Mount Manaia, Whangarei, and by Mr. Joliffe at Coromandel. As these specimens proved that the plant had been rightly referred to *Pomaderris*, Sir J. D. Hooker described it in the "*Handbook*" under the name of its discoverer. Since then it has been gathered in several scattered localities between the North Cape and Mercury Bay, but is nowhere an abundant plant.

In the Manual I have alluded to the fact that there are two forms included in the species as it is at present understood—one a small shrub with straggling or procumbent branches, and small oblong leaves scabrid above and clothed with bright ferruginous tomentum beneath; the other taller and more fastigiate branched, with longer and narrower leaves, glabrous above, and with paler tomentum beneath. Which of these forms is to be considered the type cannot be determined without reference to Edgerley's original specimens preserved at Kew. The first-mentioned variety is not uncommon on bare clay hills in the North Cape Peninsula, and is also found on the low hills between the Northern Wairoa River and the west coast south of Maunganui Bluff. The second variety is the only one known at Coromandel and southwards to Hastings and Mercury Bay, and is the one figured in this plate.

The genus *Pomaderris*, of which four species are found in New Zealand, is mainly Australian in its distribution, nearly twenty-five species being known from that country, ranging from Tasmania and Western Australia to Queensland. A single species has been described from New Caledonia.

PLATE 28. *Pomaderris Edgerleyi*, from specimens gathered at Coromandel Harbour. Fig. 1, under-surface of tip of leaf, showing stellate hairs ($\times 2$); 2, stellate hairs (enlarged); 3, flower-bud, showing the stellate hairs on the outside of the calyx ($\times 6$); 4, flower ($\times 6$); 5 and 6, stamens, front and back view ($\times 8$); 7, ovary adnate within the calyx-tube (enlarged); 8 and 9, longitudinal and transverse sections of ovary (enlarged); 10, ovule (enlarged).



West, Newman imp.

CORYNOCARPUS LAEVIGATA, Forst.

M. Smith del.
J. N. Pritch lith.

PLATE 29.—CORYNOCARPUS LÆVIGATA.

(THE KARAKA.)

FAMILY ANACARDIACEÆ.]

[GENUS CORYNOCARPUS, FORST.

Corynocarpus lævigata, Forst. Char. Gen. 31, t. 16; Cheesem. Man. N.Z. Fl. 104.

The subject of this plate is universally known throughout New Zealand by its Maori name of karaka, and must be regarded as one of the most interesting members of the flora. It was first collected by Sir Joseph Banks and Dr. Solander in Poverty Bay, on the occasion of Cook's first landing in the colony, and was subsequently observed in most of the localities visited by that illustrious explorer during his first voyage. An excellent description was prepared by Solander for his manuscript "Primiæ Floræ Novæ Zelandiæ," but was never published. It was consequently left to the two Forsters, who again collected the plant in Queen Charlotte Sound during Cook's second voyage, to describe it in their "Characteres Generum Plantarum" under the name of *Corynocarpus lævigata*.

The karaka is eminently a coastal plant, but in the North Island, in addition to fringing the coast-line from the North Cape to Cook Strait, it is also found in many lowland forests at a considerable distance from the sea. In the South Island it is purely coastal, and often decidedly local, although it is found as far south as Banks Peninsula on the east coast, and the mouth of the Buller River on the west. It is plentiful in the Kermadec Group, and attains its extreme southern limit in the Chatham Islands, where it appears to be abundant.

Corynocarpus is a very isolated genus. Although referred to the *Anacardiaceæ* by Hooker and others, it differs from that family in the total absence of the resin-canals and in the peculiar structure of the androecium. Hence Engler, in the "Pflanzenfamilien," constitutes it the type of a new family, to which the name of *Corynocarpaceæ* is applied. Mr. W. B. Hemsley, in an elaborate paper printed in the "Annals of Botany" (vol. xvii, p. 743), has discussed the relationships of the genus at considerable length, but while admitting that the absence of resin-canals shows a marked deviation from the characters of the *Anacardiaceæ*, all the other genera of which possess them, he is still of opinion that this peculiarity is not accompanied by correlated characters of sufficient importance to justify its exclusion from the family. Until the publication of Mr. Hemsley's memoir it was supposed that the genus was confined to New Zealand; but he has been able to show that there are two other species, one (*Corynocarpus similis*, Hemsl.) from the northern New Hebrides, the other (*C. dissimilis*, Hemsl.) from New Caledonia. This discovery seems to point to the probability of *Corynocarpus* being a genus of Melanesian or Malayan origin.

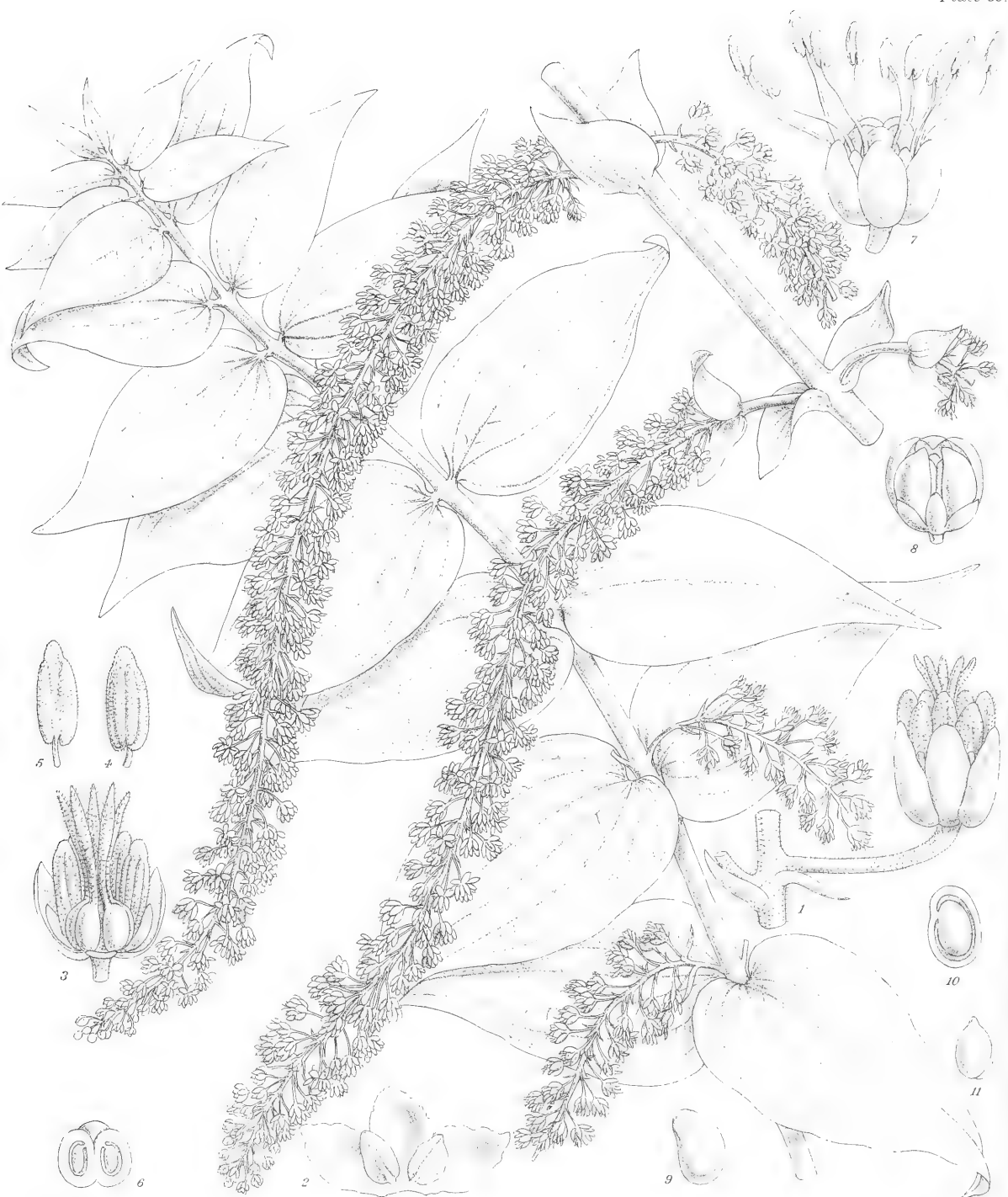
Before the arrival of Europeans the karaka was a plant of prime importance to the Maoris. Mr. Colenso, whose admirable paper on "The Vegetable Food of the Ancient New-Zealanders" (Trans. N.Z. Inst. xiii (1881), pp. 1-38) is a veritable storehouse of information, says that "its nut or seed was of inestimable value to the Maori as a common and useful article of vegetable food, second only in place to their prized kumara tuber." The pulp or flesh of the fruit was eaten raw; but the large seeds, which were the important part, required preparation before they could be eaten, for in the fresh state they are not only bitter and unpalatable, but exceedingly poisonous, causing convulsions and permanent rigidity of the muscles, often followed by death. They were therefore treated in the following manner: The seeds were collected in baskets, and placed in large heated ovens, in which they were baked or steamed for a considerable time. They were then transferred to

loosely woven baskets, which were placed in running water, and occasionally shaken, so as to remove the skin, pulp, &c. The seeds were then dried in the sun, and finally packed away for future use. When required, they were steamed in an earth oven, which rendered them softer and more easily eaten. According to Mr. Colenso, every autumn the Maoris removed in large numbers—men, women, and children—to the karaka woods on the sea-coast for the purpose of collecting the seeds and preparing them as indicated above. "As an article of vegetable food they were greatly and universally esteemed by the Maoris, and were very wholesome."

The poisonous qualities of the karaka were investigated by Mr. W. Skey in 1872 (Trans. N.Z. Inst. iv, 316). He succeeded in isolating a white, bitter substance, to which he gave the name of karakine; but the quantity obtained was too minute to admit of complete examination, and hence his results could only be regarded as provisional. More recently Professor Easterfield and Mr. B. C. Aston have re-examined the seeds, and have succeeded in preparing a sufficient amount of karakine to become acquainted with its chief properties, and to prove that it must be regarded as a glucoside, allied in several respects to the amygdaline of bitter almonds, and, like it, capable of yielding prussic acid when decomposed (Trans. N.Z. Inst. xxxiv (1902), pp. 495 and 566).

According to Maori tradition, the karaka was introduced into New Zealand from Hawaiki by some of the first Maori immigrants. Several of these legends are so precise in their details as to give not only the name of the canoe which conveyed the plant, but also the names of many of the crew and of the localities where the plant was first cultivated. Similar and equally well-defined traditions are also current among the Morioris of the Chatham Islands. But the same statements are also made respecting *Clianthus puniceus*, *Coprosma Baueri*, *Pomaderris apetala*, and other plants; and in addition certain birds, such as the pukeko (*Porphyrio melanotus*) and the parakeets (*Platycercus novæ-zealandiæ* and *P. auriceps*), are also said to have been conveyed from Hawaiki. However interesting these stories may be from an ethnographical point of view, they cannot be taken seriously. Not one of the plants mentioned above is known to be a native of any part of Polynesia; and, so far as the karaka is concerned, not a tittle of evidence can be drawn from its present distribution in New Zealand to support the view that it is an introduction from abroad. It was certainly planted by the Maoris about their villages, particularly near the coast, and remnants of groves that originated in that manner can still be seen in many localities; but such cultivation is no proof of the foreign origin of the plant.

PLATE 29. *Corynocarpus laevigata*, drawn from specimens obtained in the vicinity of Auckland. Fig. 1, portion of inflorescence ($\times 3$); 2, flower laid open ($\times 5$); 3, petal, with stamen ($\times 5$); 4, stamen ($\times 5$); 5 and 6, front and back view of staminodia ($\times 5$); 7, ovary, with style and stigma ($\times 5$); 8, section of ovary ($\times 5$); not numbered, fruit (natural size); 9 and 10, seed surrounded by endocarp (natural size); 11, embryo (natural size).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

CORIARIA RUSCIFOLIA, Linn.

PLATE 30.—CORIARIA RUSCIFOLIA.

(THE TUTU, OR TUPAKIHI.)

FAMILY CORIARIACEÆ.]

[GENUS CORIARIA, LINN.

Coriaria ruscifolia, Linn. *Sp. Plant.* 1037; *Hook. j. Fl. Nov. Zel.* i. 45; *Cheesem. Man. N.Z.* Fl. 105.

C. sarmentosa, Forst. *Prodr.* n. 377.

Few New Zealand plants are more widely known than *Coriaria ruscifolia*, the tutu of the Maoris and the subject of this plate. This is principally due to its remarkable toxic qualities, which in the early days of the colony, and in a smaller degree even up to the present time, have led to great losses among the flocks and herds of the settlers, and have even caused no small amount of mortality among human beings. As in the case of the karaka, figured on the previous plate, the tutu was originally discovered during Cook's first expedition, and was at once found to have a wide distribution. Dr. Solander correctly referred it to the genus *Coriaria*, and even pointed out its probable identity with the South American *C. ruscifolia*; but Forster, when dealing with the plants collected during Cook's second visit, chose to regard it as distinct, and published it under the name of *C. sarmentosa*. In the "Flora Novæ Zelandiæ," however, Sir J. D. Hooker united it with the South American plant, basing his opinion on the study and comparison of specimens from the two countries. This view has been acquiesced in by the leaders of botanical science, although in one or two minor publications of recent date the separation of the two plants has again been proposed. It is possible that differences of importance sufficient to warrant their dissociation may exist; but, so far as I am aware, no one of late years has made any intimate or searching comparison, and until this is done it is unwise to disturb the existing nomenclature.

As already stated, *Coriaria ruscifolia* has a wide distribution within the Dominion. It is abundant in the Kermadec and Chatham Islands, and on the mainland is found in all suitable soils and situations from the North Cape to Stewart Island, where it attains its southern limit. It is most common at low elevations, but ascends to an altitude of at least 3,000 ft. As might be reasonably predicted of a plant with such an extensive range, it is excessively variable, not only in habit and size—the latter varying from 2 ft. or 3 ft. to 25 ft. or more—but also in the size and shape of the leaves, the number and length of the racemes, the number and size of the flowers, &c. Many observers have found it difficult to believe that all these forms are referable to a single species. Thus Dr. Lauder Lindsay, in his "Contributions to New Zealand Botany," p. 34, divides *C. ruscifolia* into two species, *C. arborea* and *C. Tutu*; but he gives no diagnostic characters, and his views have not been adopted by subsequent botanists. It is much to be desired that some competent observer would thoroughly examine all the forms of the plant, fixing their relative position and limits, and comparing them with the allied species *C. thymifolia* and *C. angustissima*, both of which are very variable.

The flowers of *Coriaria* are strongly protogynous, and are evidently wind-fertilized, the pollen of the older flowers being conveyed to the younger ones. In the accompanying plate figs. 1 and 3 represent flowers in an early stage, when the styles, everywhere covered with stigmatic papillæ, protrude far beyond the flower, and are capable of pollination. But at this period the anthers are quite immature, and are almost sessile, their tips just showing above the sepals. After fertilization the styles rapidly wither and drop off; and in the meantime the filaments gradually elongate, so that the anthers, when they are ready to shed their pollen, hang far below the pendulous flowers, as shown in fig. 7. If a branch loaded

with racemes in full bloom is shaken, clouds of the incoherent pollen are given off and float away before the wind.

So much has been written on the toxic properties of the tutu that an outline of the facts is all that is required here. As is well known, the poison is present in the young shoots, leaves, and seeds of the plant. These are readily eaten by stock, and under certain circumstances, which do not appear to be fully understood, often cause wholesale poisoning. In one case as many as forty-three head of cattle out of a herd of sixty were lost. The nature of the poison was first investigated by Mr. Skey in 1864 and 1869. He showed that a greenish oil extracted from the plant was highly toxic, but failed to isolate any definite compound. In 1900 Professor Easterfield and Mr. B. C. Aston succeeded in isolating a peculiar glucoside, to which they gave the name of tutin, and which they proved by experiment to be exceedingly poisonous. They state that "a full-grown cat was killed by 0.05 grain, a pig by 2 grains, and a small dose, estimated at 0.01 grain, caused sickness and incapacity for work extending over twenty-four hours in a full-grown man." (See Trans. N.Z. Inst. xxxiii (1901), 345; also the Reports of the New Zealand Department of Agriculture for 1900 and 1901.) Lastly, in 1909 Dr. F. Fitchett published in the "Transactions of the New Zealand Institute" (vol. xli (1909), pp. 287-366) a very full and elaborate account of the physiological action of tutin, in which he reviews the work of all previous observers, and gives details of numerous experiments by himself showing the behaviour of various animals after the administration of tutin.

Notwithstanding the toxic qualities of the plant, a pleasant beverage was obtained by the Maoris from the juicy berries. These were collected in great quantities, and the juice expressed, care being taken to strain out the poisonous seeds through a sieve formed by placing a thick layer of the panicles of *Arundo conspicua* at the bottom of a small basket. The expressed juice was collected in calabashes, and was drunk with avidity. I well remember, when paying a visit to the Island of Mokoia, in Lake Rotorua, in January, 1887, seeing almost half the population engaged in collecting the berries and straining the juice. Almost every available receptacle in the little village was filled with the purplish liquid, the sweet and pleasant taste of which proved most refreshing after our tedious row across the lake.

PLATE 30. *Coriaria ruscifolia*, drawn from specimens collected on Rangitoto Island, Auckland Harbour. Fig. 1, portion of raceme, with single flower ($\times 8$); 2, portion of flower, showing three sepals and two petals ($\times 8$); 3, section of young flower, showing the pistil in a fully developed condition, while the stamens are still immature ($\times 8$); 4 and 5, anthers (enlarged); 6, section of ovary (enlarged); 7, flower, in an advanced state, the anthers ready to discharge their pollen ($\times 8$); 8, fruit ($\times 4$); 9, seed (enlarged); 10, section of seed (enlarged); 11, embryo (enlarged).



M. Smith del
J. N. Fitch lith

West, Newman imp.

CORALLOSPARTIUM CRASSICAULE Armstr.

PLATE 31.—CORALLOSPARTIUM CRASSICAULE.

(THE CORAL BROOM.)

FAMILY LEGUMINOSÆ.]

[GENUS CORALLOSPARTIUM, ARMSTR.

Corallospartium crassicaule, *Armstr. in Trans. N.Z. Inst.* xiii (1881), 333; *Cheesem. Man. N.Z. Fl.* 108.

Carmichaelia crassicaulis, *Hook. f. Handb. N.Z. Fl.* 48.

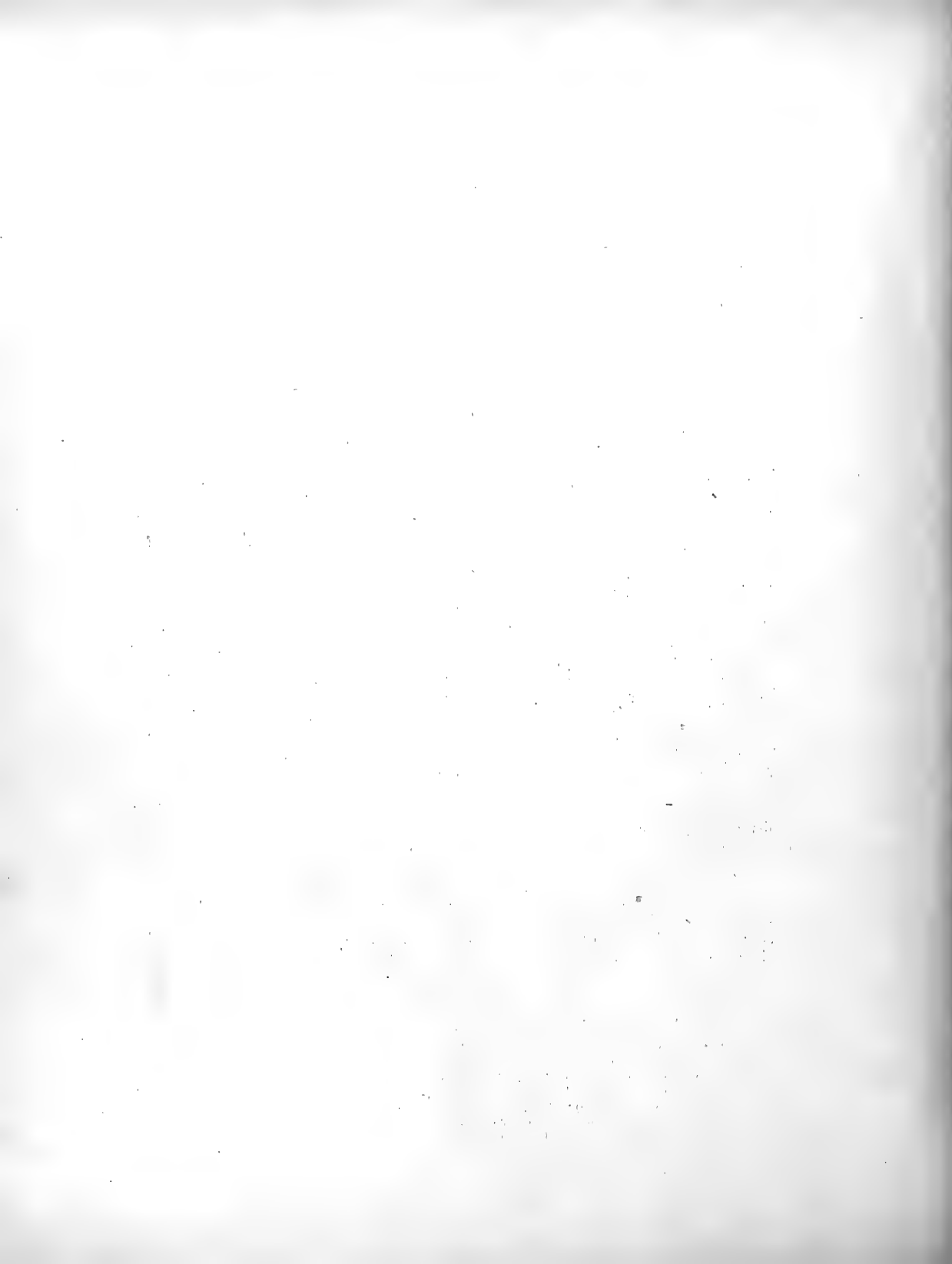
Corallospartium crassicaule is a most remarkable plant, easily recognized by its stout leafless branches, deeply channelled with numerous parallel tomentose grooves. It was discovered in the year 1861 by the late Sir Julius von Haast, while engaged on a geological exploration of the Mount Torlesse Range; and in the following year was also observed by him near Lake Ohau, in South Canterbury. Since then it has been collected in many localities between the Waimakariri basin and Central Otago, but can hardly be called an abundant plant; in fact, in some districts it is decidedly local. It appears to be confined to the eastern side of the Southern Alps, and, so far as I am aware, does not occur in any locality subject to the heavy westerly rainfall. In short, it is essentially one of those plants most at home in those dry and comparatively arid districts which lie on the eastern flanks of the central chain of the Alps, the high peaks of which either intercept or drain the moisture from the prevalent westerly winds. Its altitudinal range can be roughly given as from 1,500 ft. to 4,000 ft. elevation.

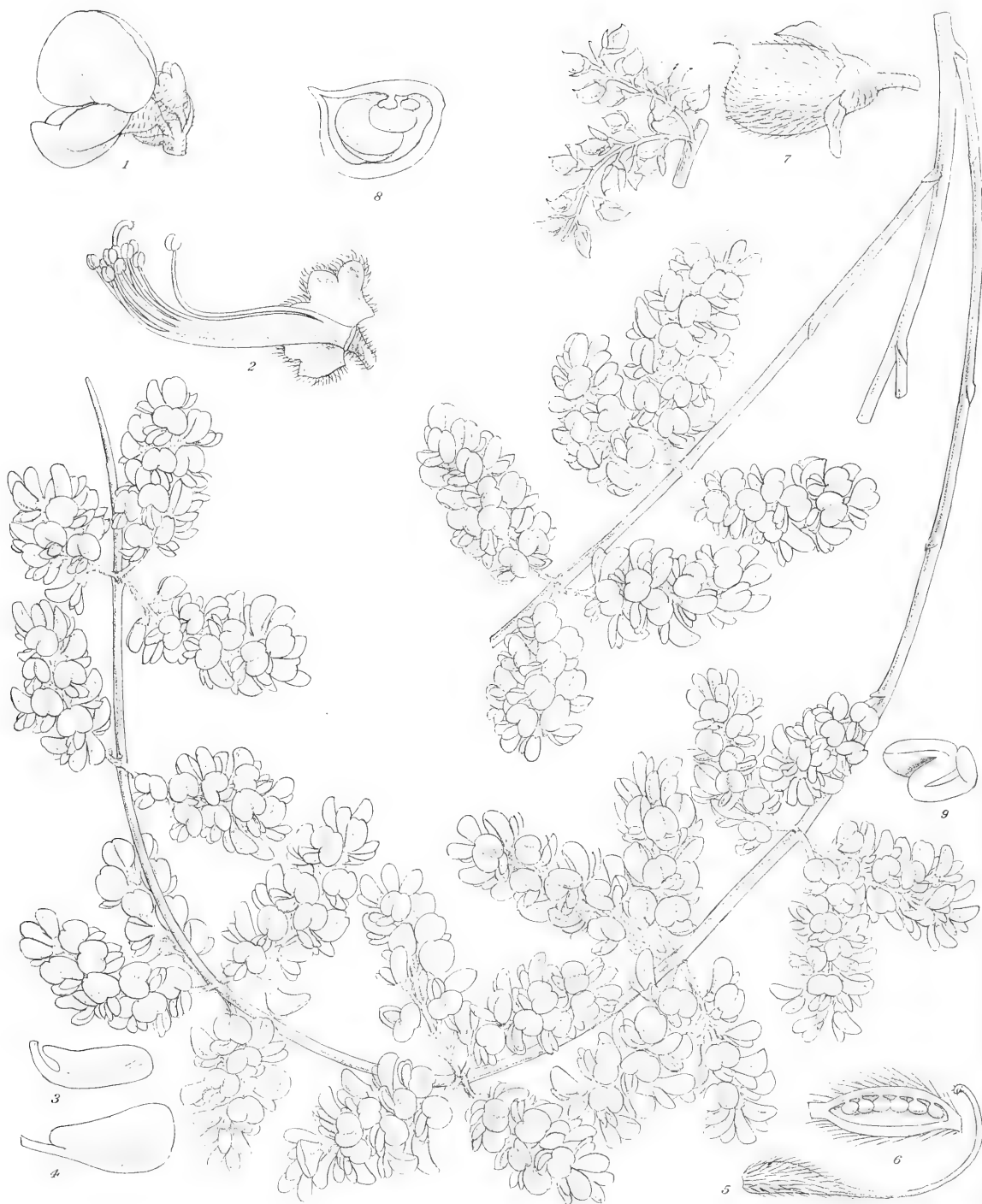
Our plant was first described by Sir J. D. Hooker in the "Handbook," and was placed by him in *Carmichaelia*. But it may be doubted whether he would have made this disposition of it if he had been acquainted with the fruit, which differs from that of *Carmichaelia* in wanting the persistent replum, and which is 1-seeded (or rarely 2-seeded) and indehiscent. On these grounds Mr. J. B. Armstrong proposed the genus *Corallospartium* for its reception.

Mr. Armstrong states that the pod splits into two valves; and Mr. Kirk, in the "Students' Flora," says that the dehiscence is "sutural." But I believe that both these are incorrect, and that the pod is indehiscent, the seed being liberated by the slow decay of the valves after the pod has fallen to the ground. Mr. A. W. Roberts, of Ranfurly, Central Otago, who has had good opportunities of becoming acquainted with the plant, states that this is invariably the case; and other competent observers hold the same opinion.

An adult plant of *Corallospartium*, with its thick yellow-green branches devoid of all leaves, presents anything but a luxuriant appearance, and resembles a bundle of dead twigs much more than a living plant. Hence the name of "Sticks" which in 1897 I found was applied to it by the shepherds of some sheep-stations near the Mount Dobson Range, on the flanks of which it is not uncommon. I have often sought for seedlings, but have never succeeded in finding one in the wild state. They are well known, however, in plants raised from seed in cultivation, and have been described and figured in Dr. Cockayne's memoir on "The Seedling Forms of New Zealand Phanerogams" (*Trans. N.Z. Inst.* xxxi, 367, t. 31).

PLATE 31. *Corallospartium crassicaule*, drawn from specimens collected by Mr. A. W. Roberts near Ranfurly, Central Otago. Fig. 1, tip of branch from a cultivated plant in the garden of the late Mr. H. J. Matthews, Dunedin, showing leaves ($\times 2$). Such leafy branchlets are often produced on cultivated specimens, but are rarely seen in wild plants. Fig. 2, flower ($\times 4$); 3, calyx laid open, showing the stamens and style ($\times 4$); 4, standard ($\times 4$); 5, one of the wing-petals ($\times 4$); 6, keel ($\times 4$); 7, ovary and style ($\times 5$); 8 and 9, longitudinal section of two ovaries ($\times 8$); 10, ripe fruit (enlarged); 11, section of same, showing two seeds (the usual number is one) (enlarged); 12, embryo, showing the double flexure in the radicle (enlarged).





M. Smith del.
J.N. Fitch lith

West, Newman imp.

CHORDOSPARTIUM STEVENSONII, *Cheesem.*

PLATE 31A.—CHORDOSPARTIUM STEVENSONI.

FAMILY LEGUMINOSÆ.]

[GENUS CHORDOSPARTIUM, CHEESEM.

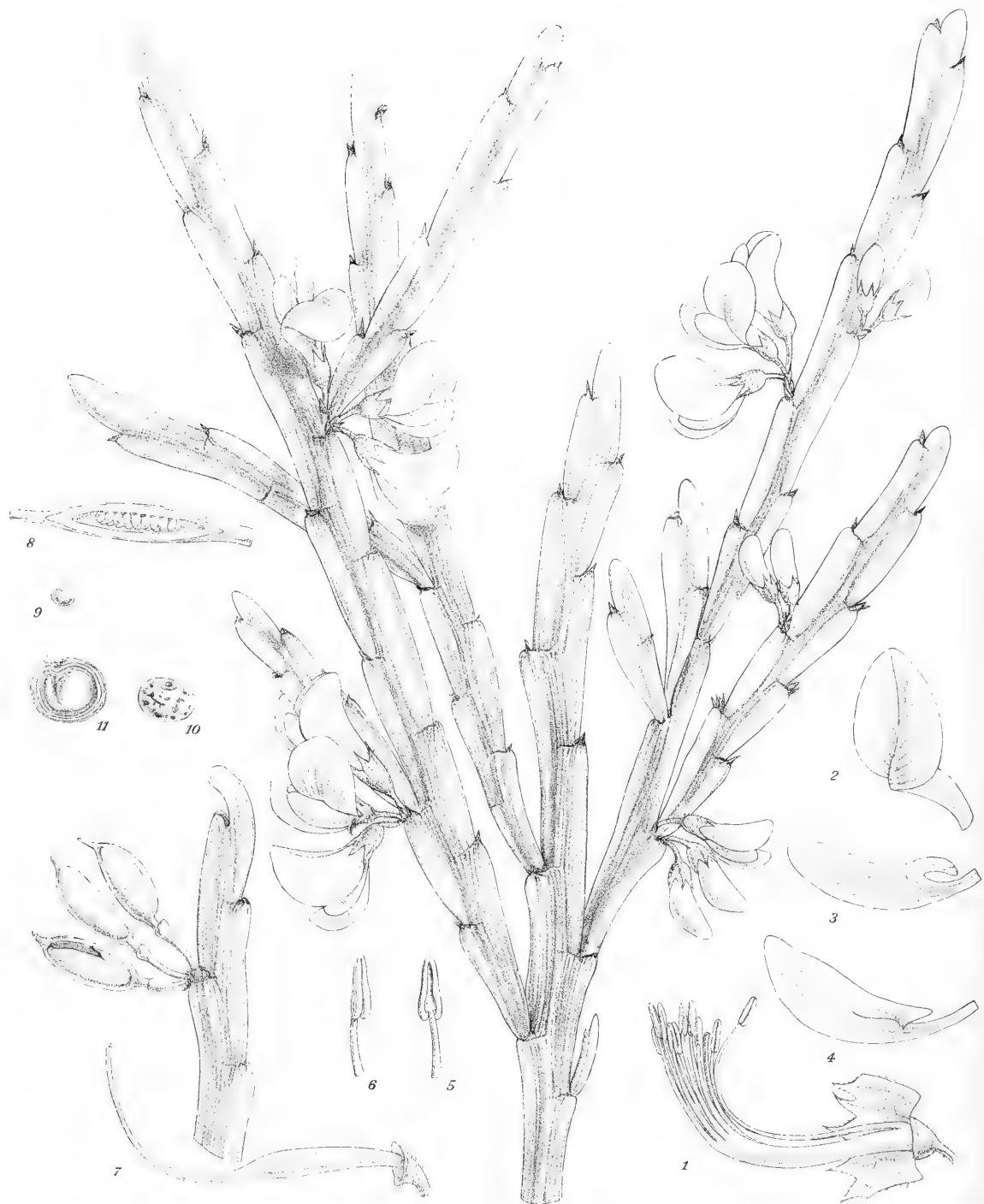
Chordospartium Stevensoni, Cheesem. in *Trans. N.Z. Inst.* xliii (1911), 175.

The beautiful plant figured in the accompanying plate is one of the most recent additions to the New Zealand flora, having been discovered by Mr. George Stevenson during the preparation of this work. According to him, it is sparingly found on the foothills of the seaward Kaikoura Mountains, near the mouth of the Clarence River, at an altitude of from 1,500 ft. to 2,500 ft. It was first described by myself in 1910, in the "Transactions of the New Zealand Institute," and is an exceedingly curious plant, in some respects connecting the genera *Corallospartium*, *Carmichaelia*, and *Notospartium*. As I have elsewhere remarked, it agrees with the first in the short turgid subrhomboid 1-seeded pod, but differs altogether in habit, in the slender branchlets, and in the markedly different inflorescence. From the section *Huttonella* of *Carmichaelia* it is separated by the same characters. It entirely corresponds with *Notospartium* in habit and inflorescence, and has probably been mistaken for that genus in the absence of fruit, which is entirely different.

Although I consider that the characters of *Chordospartium* fully justify its erection into a separate genus, it must be confessed that the differences between it and *Corallospartium* are not of a very pronounced type. If, however, differences of habit, inflorescence, &c., are not considered sufficient to separate *Corallospartium* and *Chordospartium*, then, by parity of reasoning, similar characters of no greater importance cannot be used to distinguish both these groups from the section *Huttonella* of *Carmichaelia*, and the three genera must merge into one. Some botanists may prefer this course, for it is very much a matter of taste and personal idiosyncrasy whichever view is adopted.

I have to express my obligations to Mr. Stevenson for his kindness in forwarding an ample supply of both flowering and fruiting specimens. Most of these were obtained from a tree growing near his house, which he describes as a beautiful specimen, with a stem bare of branches for about 8 ft., above which "it is a perfect weeping model all round for quite 15 ft." Its girth at about 2 ft. from the ground was 20 in. The flowering season stretches from the middle of November to the end of December, and the fruit is ripe at the beginning of April.

PLATE 31A. *Chordospartium Stevensoni*, drawn from specimens collected by Mr. George Stevenson near the mouth of the Clarence River. Fig. 1, flower ($\times 4$); 2, calyx laid open, the petals being removed to show the stamens, &c. ($\times 8$); 3, wing-petal ($\times 6$); 4, keel ($\times 6$); 5, ovary and style ($\times 8$); 6, section of ovary ($\times 6$); 7, ripe pod ($\times 5$); 8, section of same ($\times 5$); 9, embryo, showing the double flexure of the radicle (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

CARMICHAELIA WILLIAMSII, T. Kirk.

PLATE 32.—CARMICHÆLIA WILLIAMSII.

FAMILY LEGUMINOSÆ.]

[GENUS CARMICHÆLIA, R. BR.

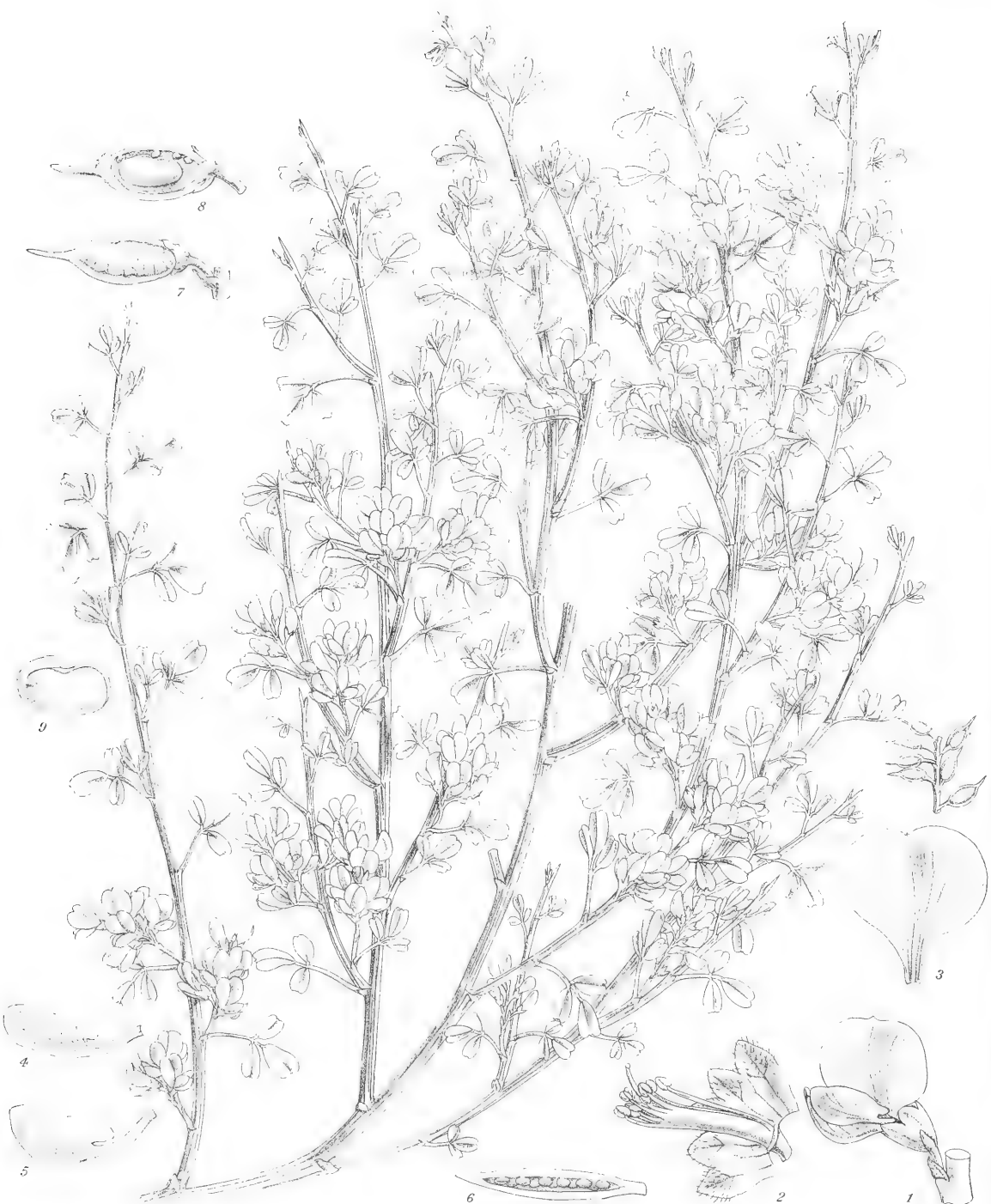
Carmichælia Williamsii, T. Kirk in *Trans. N.Z. Inst.* xii (1880), 394; *Cheesem. Man. N.Z.* Fl. 112.

The genus *Carmichælia* includes a considerable number of species exceedingly difficult of discrimination. But in *C. Williamsii*, the subject of this plate, we have a plant which is perfectly distinct in habit, flowers, and fruit, and which cannot possibly be confounded with any other. The broad and thin branchlets (or cladodes), the large yellowish-red flowers, and the unusually large turgid pod are characters much too prominent to be easily overlooked.

C. Williamsii was named in honour of the Right Rev. W. L. Williams, D.D., Bishop of Waiapu, who originally discovered it at Hicks Bay, in the East Cape district. It appears to have a very limited distribution, advancing westward as far as Te Kaha Point, and in an easterly direction barely reaching the East Cape. It is thus confined to a strip of coast-line scarcely fifty miles in length. In the Manual I have given the height of the plant at "from 3 ft. to 8 ft. high," but Bishop Williams informs me that it attains a much larger size, in some cases reaching 18 ft., with a trunk 4 in. in diameter. If so, it may be ranked as the tallest species of the genus; *C. australis* rarely exceeding 12 ft. and *C. odorata* 10 ft. in height. The Lord Howe Island *C. exsul*, F. Muell, the only species of the genus not found in New Zealand, is said to reach the extreme height of 14 ft., but it is very imperfectly known.

Some varieties of *C. australis* approach *C. Williamsii* in the breadth of the cladodes, and in the absence of flowers and fruit might easily be mistaken for it. But the large flowers and large turgid pod of *C. Williamsii* are widely different from the small lilac flowers and small compressed pod of *C. australis*, and flowering or fruiting specimens of the two species can be separated at a glance.

PLATE 32. *Carmichælia Williamsii*, drawn from specimens collected by Bishop Williams at Hicks Bay, East Cape district. Fig. 1, calyx laid open and petals removed to show the stamens ($\times 2$); 2, standard ($\times 2$); 3, one of the wing-petals ($\times 2$); 4, keel ($\times 2$); 5 and 6, front and back view of an anther ($\times 4$); 7, ovary and style ($\times 3$); 8, longitudinal section of ovary ($\times 4$); 9, seed (natural size); 10, seed ($\times 2$); 11, section of seed, showing embryo ($\times 3$).



M. Smith del.
J. N. Pritch lith.

West, Newman imp.

CARMICHAELIA GRANDIFLORA, Hook. f.

PLATE 33.—CARMICHLÆLIA GRANDIFLORA.

FAMILY LEGUMINOSÆ.]

[GENUS CARMICHLÆLIA, R. BR.

Carmichælia grandiflora, Hook. f. *Handb. N.Z. Fl.* 49; *Cheesem. Man. N.Z. Fl.* 115.

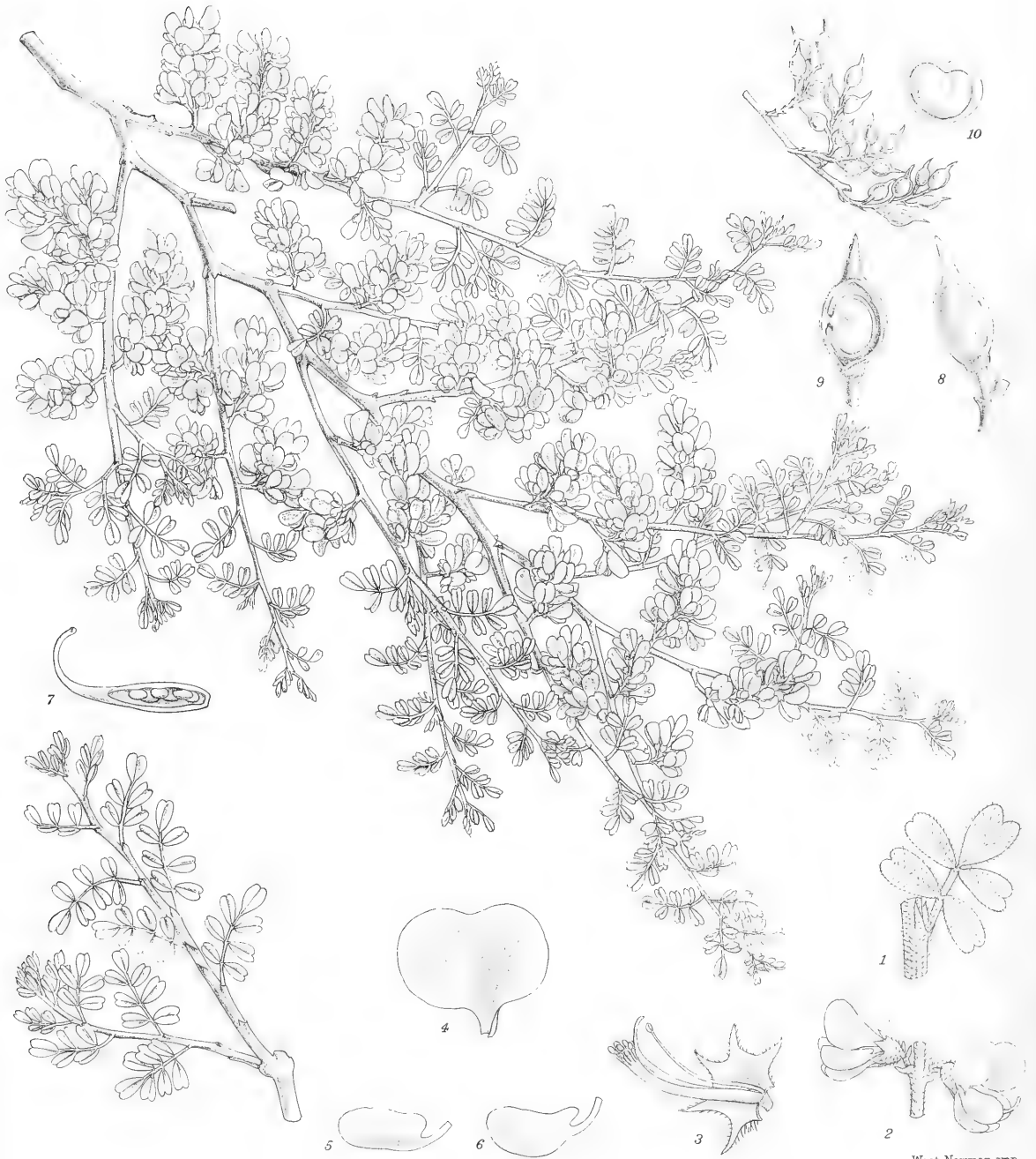
This is one of the many plants added to the New Zealand flora by Dr. Lyall, who, as surgeon-naturalist on H.M.S. "Acheron" during the years 1847-51, made large collections in the Sounds of the south-west coast of Otago, and elsewhere on the coast-line of the South Island. His specimens were gathered in Milford Sound, and were considered by Mr. Bentham (who prepared the account of *Carmichælia* given in the "Flora Novæ Zelandiæ") to be a variety of the common North Island *C. australis*. In 1862 Sir Julius von Haast collected the same plant in the Mount Cook district, where it is not uncommon; and a few years later Mr. Buchanan gathered it in the Lake district of Otago. As the specimens obtained in the localities quoted above amply proved the distinctness of the species, Sir J. D. Hooker published it in the "Handbook" under the name which it now bears.

Carmichælia grandiflora ranges from the south of the Nelson Provincial District to Port Preservation, on the south-west coast of Otago. It is essentially a plant of those districts which receive the abundant rainfall of the western side of the South Island, and hence it is common in the river-valleys of Westland, and in the Sounds of the south-west coast of Otago, where it descends to sea-level. But towards the head of the great rivers which flow from the dividing-range of the Southern Alps to the eastern coast there are many places which participate in the heavy westerly rainfall, and in these *C. grandiflora* flourishes in perfection; such as the sources of the Waimakariri, the head of the Rakaia and Rangitata, and the Mount Cook district. The altitudinal range of the plant is from sea-level to 3,500 ft. or nearly 4,000 ft.

C. grandiflora, with its close ally *C. odorata*, differs from most of the species of *Carmichælia* in being decidedly leafy in spring and summer. But in autumn the leaves are more or less deciduous, so that the plant then assumes the characteristic leafless habit of the genus. It is an exceedingly variable plant. Mr. T. Kirk, in his "Students' Flora," enumerates three varieties, and there are other distinct-looking forms. These varieties differ in size, in the mode of branching, in the number and colour of the flowers, and in the size and shape of the pod. But before their systematic position can be properly understood they all require careful study and examination in the field.

Like several of the species of *Carmichælia*, the flowers are deliciously sweet-scented. Mr. T. Kirk, in the "Students' Handbook," says that the flowers of his variety *alba* "smell disgustingly of mice." But this peculiarity, so far as my own observations go, is only noticeable when the plant is being dried. In the fresh state the odour of the flowers is decidedly pleasant.

PLATE 33. *Carmichælia grandiflora*, drawn from specimens gathered in the Mount Cook district, at an elevation of 3,000 ft. Fig. 1, flower ($\times 3$); 2, calyx laid open and petals removed to show the stamens and the upper part of the style ($\times 4$); 3, standard ($\times 5$); 4, one of the wing-petals ($\times 4$); 5, keel ($\times 4$); 6, section of ovary ($\times 6$); 7, ripe pod ($\times 3$); 8, section of pod ($\times 3$); 9, embryo ($\times 5$).



M. Smith del.
J.N. Fitch lith

West, Newman imp.

CARMICHAELIA ODORATA, Col.

PLATE 34.—CARMICHLÆLIA ODORATA.

FAMILY LEGUMINOSÆ.]

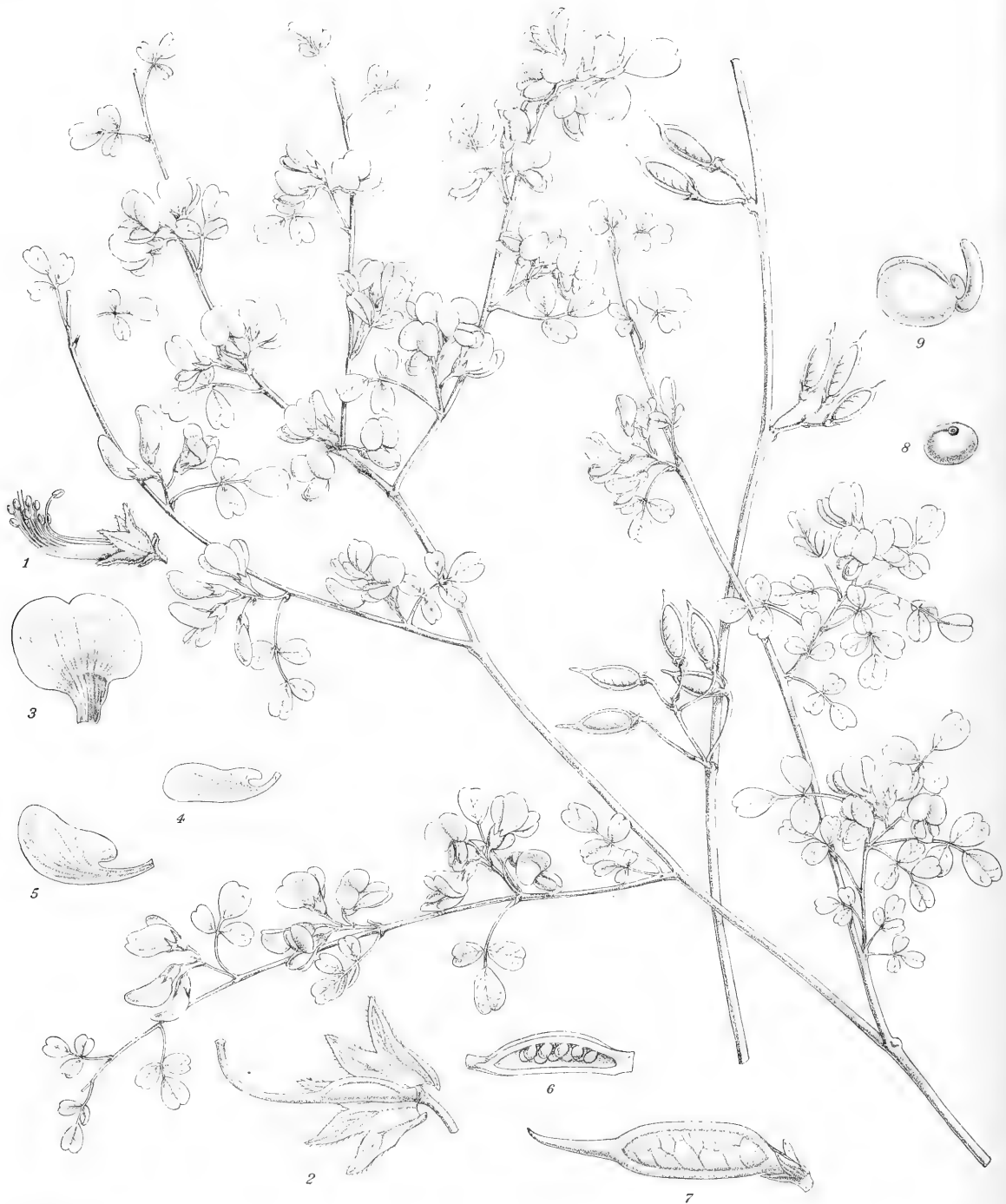
[GENUS CARMICHLÆLIA, R. BR.

Carmichælia odorata, Col. ex Hook. f. *Fl. Nov. Zel.* i, 50; *Cheesem. Man. N.Z. Fl.* 115.

This beautiful plant was first detected by Mr. Colenso in December, 1843, while travelling from Wairoa (Hawke's Bay) to Lake Waikaremoana; and in the following year he also observed it in great abundance between Hawke's Bay and the foot of the Ruahine Range. Being much impressed by the odour of the flowers, which, as he says, "filled the air with their fragrance," he gave it the MS. name of *Carmichælia odorata*, and under this appellation it was published by Sir J. D. Hooker in the "Flora Novæ Zelandiæ." Subsequent observers have found that it is by no means uncommon along the flanks of the Ruahine and Tararua Ranges as far south as Cook Strait. Mr. Kirk has gathered it in Pelorus Sound, and specimens collected in the Nelson Provincial District by Travers and Monro were referred to it by Hooker, but I have not myself seen it on any South Island locality.

C. odorata is closely allied to *C. grandiflora*, but can easily be distinguished by its taller and more slender habit, narrower pendulous branchlets, which are pubescent at the tips, smaller flowers, and shorter pods. It has the same leafy habit as *C. grandiflora*; and, as in that species, the leaves are mostly deciduous after the ripening of the pods. Herbarium specimens do not, as a rule, give the idea that the branchlets are pendulous; and hence it is easy, when working upon those alone, to form the opinion that the racemes are drooping. In reality they are always erect, as will be easily understood on an examination of the plate.

PLATE 34. *Carmichælia odorata*, drawn from specimens collected near the base of the Ruahine Mountains by Bishop Williams. Fig. 1, leaf ($\times 3$); 2, flowers ($\times 4$); 3, calyx laid open, with the petals removed, showing the stamens and the upper part of the style ($\times 5$); 4, standard ($\times 5$); 5, wing-petal ($\times 5$); 6, keel ($\times 5$); 7, section of ovary ($\times 6$); 8, ripe pod ($\times 4$); 9, section of pod ($\times 4$); 10, section of seed ($\times 5$).



M. Smith del.
J. N. Pritch lith

West, Newman imp.

CARMICHAELIA GRACILIS, *Armstr.*

PLATE 35.—CARMICHAELIA GRACILIS.

FAMILY LEGUMINOSÆ.]

[GENUS CARMICHAELIA, R. BR.

Carmichaelia gracilis, *Armstr. in Trans. N.Z. Inst.* xiii (1880), 336; *Cheesem. Man. N.Z.* Fl. 117.

This curious species was first discovered by Mr. J. B. Armstrong on the site of the City of Christchurch, some time prior to 1870, and in 1880 was published by him under the name of *Carmichaelia gracilis*. In 1882 Mr. T. Kirk and Mr. D. Petrie separately collected it in several widely separated localities in Otago; but, unfortunately, the identity of their specimens with Mr. Armstrong's was not at first recognized, so that it was figured and described by Sir J. D. Hooker in the "Icones Plantarum" under the name of *C. Kirkii* (t. 1332). Since then the plant has been found in several other localities in eastern and Central Otago; and as a comparison of Otago and Canterbury specimens has failed to disclose any differences between them the name of *C. gracilis* must be applied to both. The plant therefore appears under that name in my "Manual of the New Zealand Flora." Its distribution has not yet been fully ascertained, but it is apparently a somewhat rare and local plant, extending from the Waimakariri River to eastern and Central Otago. Its altitudinal range is from sea-level to 1,500 ft.

C. gracilis has a very different habit from the majority of the species of *Carmichaelia*. Its long and flexuous stems and branches are usually unable to support their own weight, and are either interlaced with the adjacent vegetation or with themselves, or are even partially scandent. In moist shaded situations it is decidedly leafy; but in drier localities, exposed to sun and wind, the plant is often quite leafless. Its peculiar habit, large flowers, and large turgid pod, with a long almost pungent beak, easily separate it from all other species of the genus.

PLATE 35. *Carmichaelia gracilis*, drawn from specimens collected by Mr. D. Petrie at Otepopo, Otago. Fig. 1, flower, with petals removed ($\times 3$); 2, calyx laid open, with petals and stamens removed, showing the ovary and style ($\times 5$); 3, standard ($\times 3$); 4, one of the wing-petals ($\times 3$); 5, keel ($\times 3$); 6, section of ovary ($\times 8$); 7, ripe pod ($\times 3$); 8, seed ($\times 3$); 9, embryo ($\times 6$).



M. Smith del.
J. N. Pritch. lith.

West, Newman imp.

NOTOSPARTIUM CARMICHAELIAE, Hook. f.

PLATE 36.—NOTOSPARTIUM CARMICHAELIÆ.

FAMILY LEGUMINOSÆ.]

[GENUS NOTOSPARTIUM, HOOK. F.

Notospartium Carmichaeliæ, Hook. f. *Handb. N.Z. Fl.* 51; *Cheesem. Man. N.Z. Fl.* 119.

Notospartium Carmichaeliæ was originally discovered on Christmas Day, 1853, by Sir David Monro, one of the earliest explorers of the botany of the north-east portion of the South Island. His specimens were obtained "on the sandy and rocky banks of the Waihopai River," which is the chief tributary of the Wairau River. In 1858 it was gathered in some locality in Canterbury by Mr. Robert Waitt, a gentleman of means who visited New Zealand more than once, and who made a small collection of plants which he gave to Sir W. J. Hooker. In 1860 Dr. Sinclair gathered it in the Awatere Valley, Marlborough; and since then it has been collected in several scattered localities by Sir Julius von Haast, Mr. J. B. Armstrong, Rev. F. H. Spencer, Mr. H. J. Matthews, Dr. Cockayne, and others; its range being apparently from the Wairau Valley southwards through Marlborough and North Canterbury to Mount Peel. So far as I can ascertain, it is nowhere an abundant plant, and is fast becoming rare in several of its habitats. Its altitudinal range is from 500 ft. to 2,500 ft.

In 1897 the late Mr. T. Kirk pointed out that two types of fruit existed in *Notospartium*—one a straight 3-5-seeded pod, the other a falcate or strongly curved pod containing from 3 to 10 seeds. The first he referred to the typical *N. Carmichaeliæ*; on the second he founded his new species *N. torulosum*. In investigating the matter I have been much puzzled at finding little or no difference in the flowers of the whole of the specimens brought under my notice, while there is considerable deviation in the shape of the pod. This made it important to ascertain what kind of pod the type of *N. Carmichaeliæ* possessed. At my request Mr. W. B. Hemsley was kind enough to examine the whole of the specimens in the Kew Herbarium. He informs me that Monro's type is in flower only, and that the description of the fruit given by Hooker in the "Hand-book" was based on Waitt's Canterbury specimens. These have a perfectly straight 6-8-seeded pod, and agree exactly with the figure given in the *Botanical Magazine*. I may say that ripe pods sent to me many years ago by Sir Julius von Haast also correspond.

The flowering specimens figured in the accompanying plate were kindly obtained for me by Mr. W. Stevenson, of Upcot, Upper Awatere Valley, and agree with Hooker's plate in the *Botanical Magazine*, so far as the flowers go. But the pods sent by Mr. Stevenson and figured on the plate are altogether different, being strongly curved and much shorter than those figured by Hooker. As the Upper Awatere is only a short distance from the Waihopai Valley, there is a possibility that Monro's type may also have curved pods, and in that case Kirk's *N. torulosum* sinks into the position of a synonym of *N. Carmichaeliæ*, and a new name will be required for the plant with long straight pods collected by Waitt and others in Canterbury. In the accompanying plate I have given a drawing (fig. 6) of a third type of pod, collected by Mr. George Stevenson near the mouth of the Clarence River, and which is remarkable for being broadest towards the tip, thus differing from Waitt's specimens, which are of equal width throughout. It is much to be desired that some Canterbury resident would clear up the confusion which at present envelops the genus and succeed in matching the floral and carpological characters of the various forms or species.

PLATE 36. *Notospartium Carmichaeliæ*, flowers, fruit, and young plant, drawn from specimens collected by Mr. W. Stevenson at Upcot, in the Upper Awatere Valley. Fig. 1, flower with the calyx laid open, the petals being removed to show the stamens and the upper part of the style ($\times 4$); 2, standard ($\times 5$); 3, one of the wing-petals ($\times 5$); 4, keel ($\times 5$); 5, longitudinal section of ovary ($\times 4$); 6, pod, from a fruiting specimen collected by Mr. George Stevenson near the mouth of the Clarence River (enlarged); 7, seed (enlarged); 8 and 9, different views of embryo, showing the double flexure of the radicle.



M. Smith del.
J.N. Fitch lith

West, Newman imp.

RUBUS PARVUS, Buch.

PLATE 37.—RUBUS PARVUS.

FAMILY ROSACEÆ.]

[GENUS RUBUS, LINN.

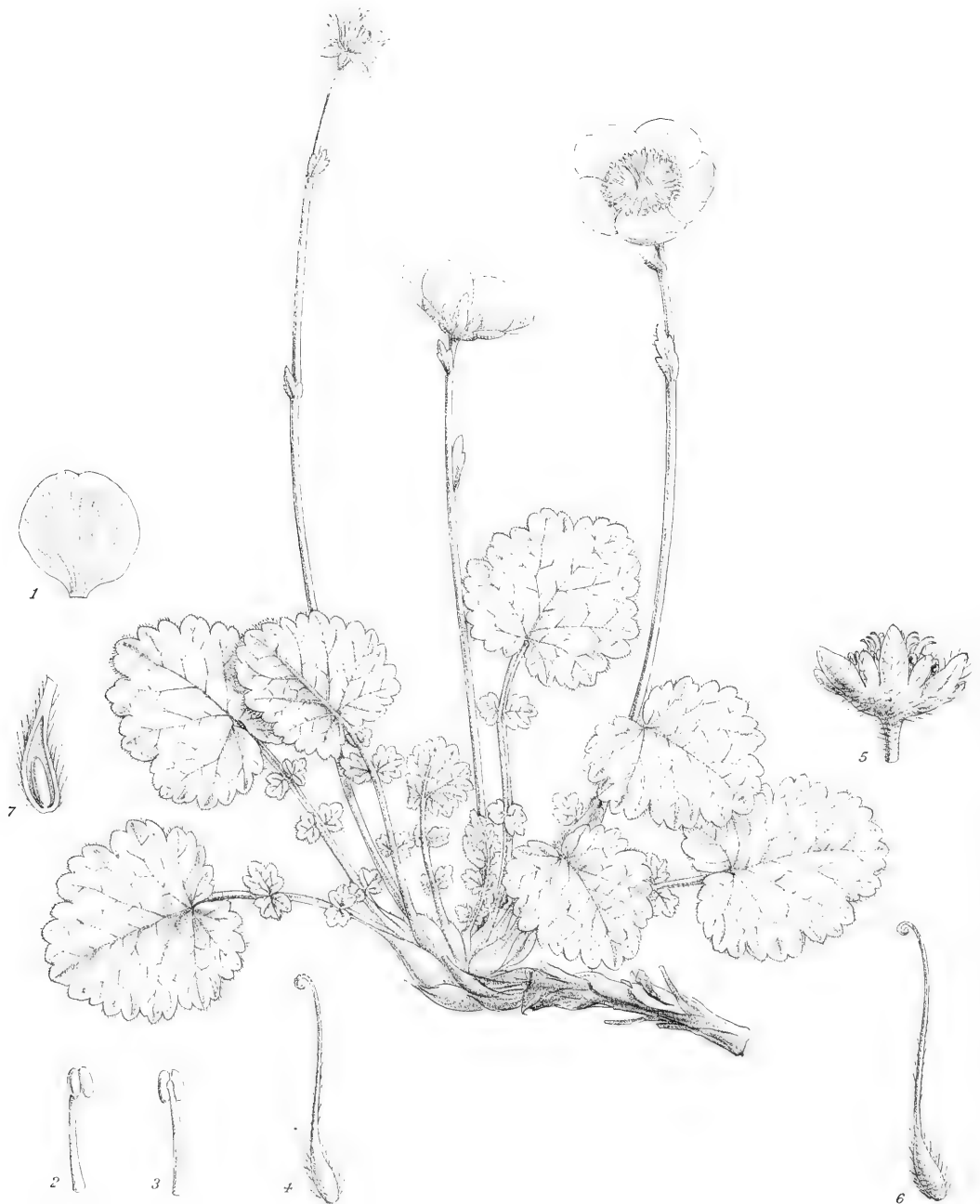
Rubus parvus, Buch. in *Trans. N.Z. Inst.* vi (1874), 243, t. 22; *Cheesem. Man. N.Z. Fl.* 126.

For the discovery of this curious little species we are indebted to Sir James Hector, who collected it near Lake Brunner, Westland, in December, 1873. His specimens were communicated to Mr. J. Buchanan, who published the species early in the following year. Since then it has been gathered in several localities on the western side of the South Island. I have seen specimens collected in the Heaphy Valley by Mr. J. Dall; in the Buller Valley by Mr. T. Kirk, and later on by Mr. Townson; near Lyell by Dr. Gaze; in the Teremakau Valley by Mr. Kirk; and in the Otira Valley by Mr. Petrie and myself. I am not aware of any records of stations further to the south, but I cannot doubt that it exists in suitable localities along the whole length of Westland.

Rubus parvus is essentially a plant of river-valleys. Its prostrate stems are often partly buried in the soil; but it puts up numerous short branchlets which bear terminal or axillary few-flowered panicles. The leaves are remarkable for their fine bronzy or bronzy-purple coloration, which gives the plant quite an attractive appearance—in fact, it might almost be called a decorative plant. The fruit is larger than in any other of the New Zealand species, being sometimes quite an inch in length, resembling large raspberries. Mr. Buchanan states that it is collected and made into preserves.

Notwithstanding the late Mr. Kirk's opinion that "it may be an arrested form of *R. australis*," I have always looked upon *Rubus parvus* as a remarkably distinct species, well characterized by its small size, 1-foliolate leaves with sharply dentate margins, long acuminate sepals, and large oblong fruit. At the same time, it is in some respects a variable plant. I have seen specimens in which some of the leaves are 3-foliolate, others showing a considerable range of variation in size, shape, and in the extent of the toothing of the leaf-margin. A very remarkable allied form, differing in the larger size, 3-foliolate leaves, and lanceolate leaflets with serrate rather than dentate margins, has been cultivated at Christchurch for more than twelve years without flowering, and has recently been published by Dr. Cockayne (under the name of *R. Barkeri*) as a "non-flowering New Zealand species of *Rubus*" (*Trans. N.Z. Inst.* xlii (1910), 325).

PLATE 37. *Rubus parvus*, drawn from specimens collected by Mr. J. W. Brame in the Teremakau Valley, Westland. Fig. 1, portion of leaf; 2, flower, just prior to expansion; 3, section of calyx; 4, petal; 5 and 6, different views of stamens. (All enlarged.)



M. Smith del.
J. N. Fitch lith.

GEUM UNIFLORUM, Buch.

West, Newman imp.

PLATE 38. -GEUM UNIFLORUM.

FAMILY ROSACEÆ.]

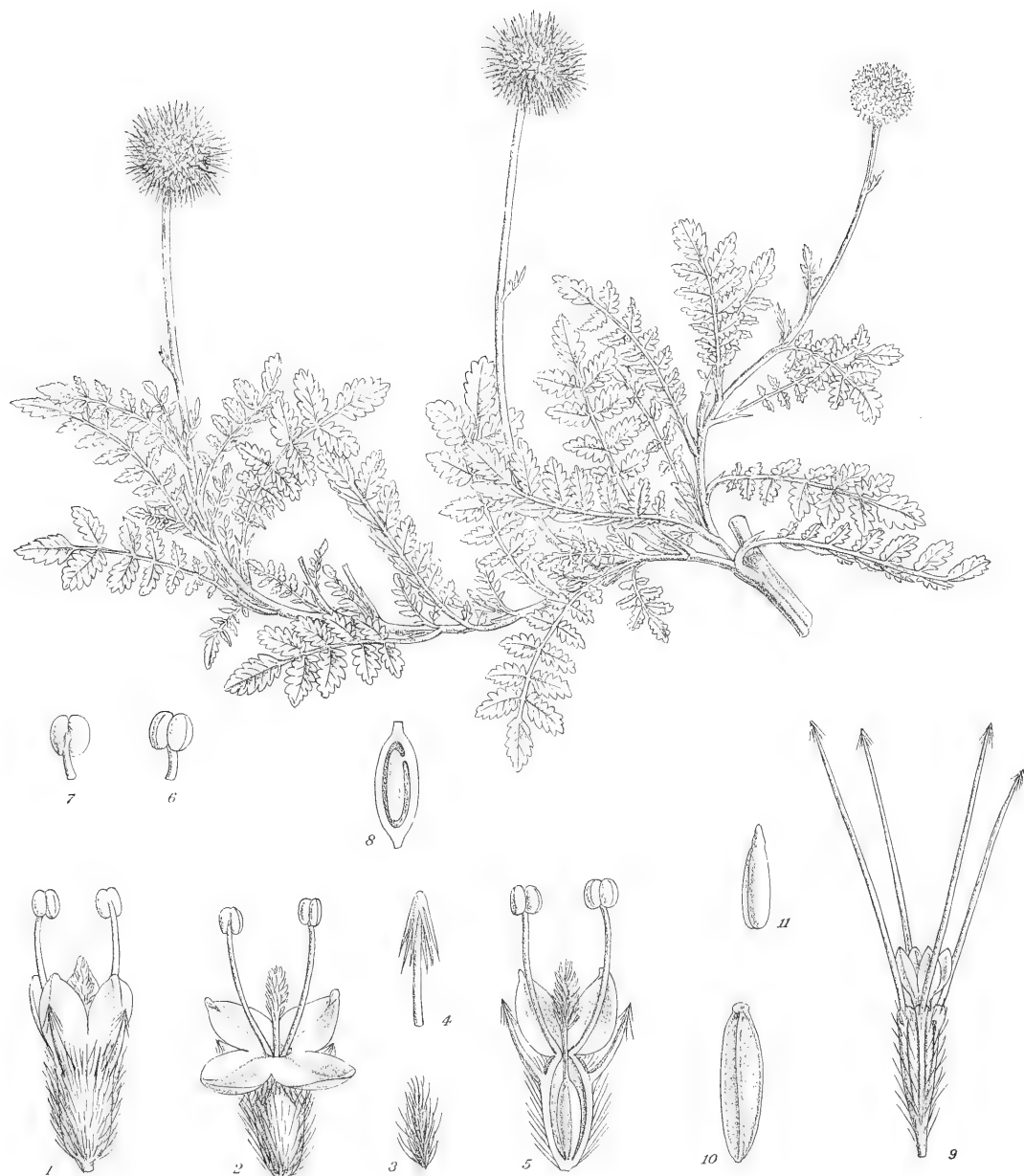
[GENUS GEUM, LINN.

Geum uniflorum, *Buch. in Trans. N.Z. Inst.* ii (1870), 88; *Cheesem. Man. N.Z. Fl.* 128.

The genus *Geum* has six representatives in New Zealand, and of these the subject of this plate is by far the most attractive, from its large white flowers and curious reddish-brown leaves ciliated with orange-yellow hairs. It was first discovered by Mr. H. H. Travers in 1868 in the Upper Waiiau Valley, Nelson, and has since been found to be plentiful in many localities along the central chain of the Southern Alps, more especially on the western side. In 1880 I observed it in great abundance on the steep, rocky, and grassy slopes overlooking Arthur's Pass and the Otira Gorge, and a year or two later in similar situations near the Waimakariri Glacier. Dr. Cockayne (*Trans. N.Z. Inst.* xxxvii (1905), 365) says that it is "an extremely common plant of subalpine and alpine meadows and moist shady rocky places in Westland." Its northern limit appears to be on the mountains between Collingwood and Mount Arthur (north-west Nelson), where it was recently detected by Mr. F. G. Gibbs. Turning to the south, in January, 1909, the late Mr. H. J. Matthews and Mr. F. G. Gibbs gathered it on McKinnon's Pass, south-west Otago, and about the same time Mr. Crosby-Smith collected it on the Takitimo Ranges, Southland, which is the furthest-south station known. I have not seen it at a lower elevation than 3,000 ft., but it ascends to considerably over 5,000 ft. in one or two localities known to me.

The genus *Geum* is one of those which are found in the temperate and frigid zones of both the Northern and Southern Hemispheres. One species advances as far north as Melville Island, far within the Arctic Circle, and quite a number of species are found in arctic Asia, Europe, and America. In the tropics the genus is not known in lowland stations, but it reappears on the higher mountain ranges, such as the Andes and Himalayas; and in South America, South Africa, and Australasia once more comes down to sea-level in the southern portions of the three countries.

PLATE 38. *Geum uniflorum*, drawn from specimens gathered on the mountains above Arthur's Pass, Canterbury Alps; alt. 4,000 ft. Fig. 1, petal ($\times 2$); 2 and 3, different views of stamens ($\times 6$); 4, carpel ($\times 6$); 5, fruit ($\times 2$); 6, ripe carpel ($\times 8$); 7, section of ripe carpel, showing seed ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp

ACAENA NOVAE-ZEALANDIAE, T. Kirk.

PLATE 39.—ACÆNA NOVÆ-ZELANDIÆ.

FAMILY ROSACEÆ.]

[GENUS ACÆNA, LINN.

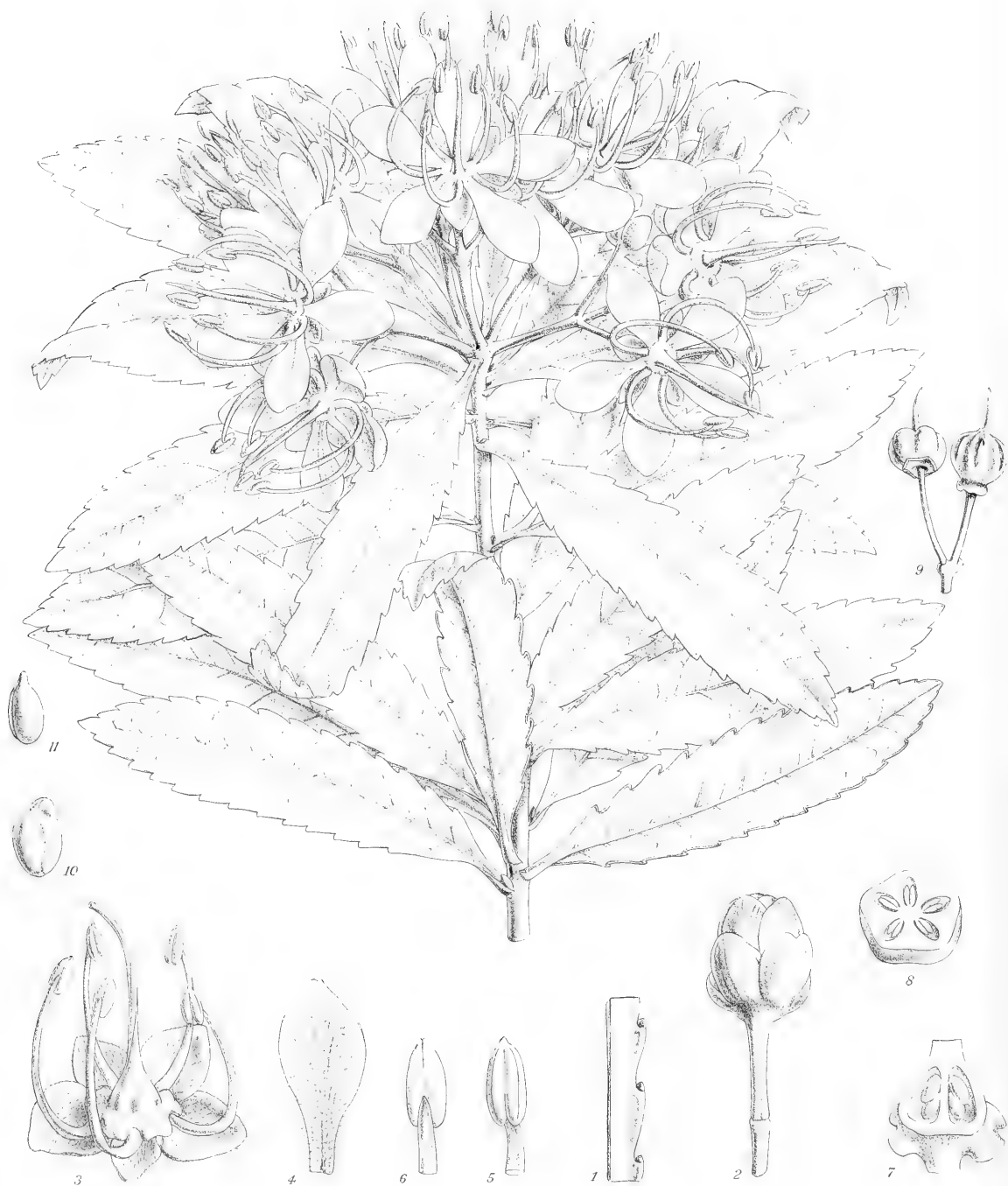
Acæna novæ-zelandiæ, T. Kirk in *Trans. N.Z. Inst.* iii (1871), 177; *Cheesem. Man. N.Z. Fl.* 131.

The first mention of the name of *Acæna novæ-zelandiæ* that I am acquainted with is in Dr. Lauder Lindsay's "Contributions to New Zealand Botany," published in 1868, where (pp. 57, 58) he refers to a plant then largely cultivated in England under that name, possessing both red-flowered and green-flowered varieties, and which he states "is probably referable to *A. Sanguisorbæ*." Dr. Lindsay gives no description, and his remarks are not in themselves sufficiently precise to warrant the identification of his plant with that now known to New Zealand botanists; but two years later Mr. T. Kirk sent specimens collected on the Auckland Isthmus to Sir J. D. Hooker, who informed him that they corresponded with a plant known in English gardens under the name of *A. novæ-zelandiæ*. Kirk accordingly published the species under that designation in 1870. Attention once being drawn to the plant, it was soon found to be widely distributed, and it is now known to extend through both the North and the South Islands, although mainly in lowland stations. It also crosses Foveaux Strait into Stewart Island, where Dr. Cockayne reports it as "common."

As a species *A. novæ-zelandiæ* is very closely allied to the common *A. Sanguisorbæ*, from which it principally differs in its greater size and coarser habit of growth, much larger heads with longer purplish-red spines, and in the longer and narrower achene. Individually these are differences of small moment, but collectively I think they are sufficient to keep the plants apart. In Bitter's recent revision of the genus ("Bibliotheca Botanica," heft 74) it is, however, treated as a subspecies of *A. Sanguisorbæ*.

The geographical distribution of *Acæna* is peculiar. In the "Naturlichen Pflanzenfamilien" the number of species is estimated at forty. Of these, only three are found in the Northern Hemisphere—one in California, another in Mexico, and the third in the Sandwich Islands. The chief home of the genus is in temperate and antarctic South America, but there are seven or eight species in New Zealand and Australia (or more according to some authors), some of them also occurring in the Subantarctic Islands. There is also one isolated species in South Africa.

PLATE 39. *Acæna novæ-zelandiæ*, drawn from specimens collected in the vicinity of Auckland. Figs. 1 and 2, flowers; 3, plumose stigma; 4, tip of calycine bristles or spines; 5, section of flower; 6 and 7, front and back view of anthers; 8, section of ovary; 9, ripe fruit, enclosed in the persistent calyx, the bristles or spines of which are greatly elongated; 10, seed; 11, embryo.



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

IXERBA BREXIOIDES, A. Cunn

PLATE 40.—IXERBA BREXIOIDES.

FAMILY SAXIFRAGACEÆ.]

[GENUS IXERBA, A. CUNN.]

Ixerba brexioides, A. Cunn. *Precur.* n. 580; *Cheesem. Man. N.Z. Fl.* 136.

Ixerba is a monotypic genus confined to New Zealand. It has no very close allies, but is usually placed next to the Madagascar genus *Brexia*. But the flat fleshy disc of *Ixerba*, with its broad blunt lobes alternating with the stamens, is very different from the thin disc of *Brexia*, united with the base of the filaments, and divided into linear erect lobes. There is also a marked divergence in the ovary, *Ixerba* having only two ovules in each cell, whereas *Brexia* has very numerous ovules arranged in two series on often pulpy placentas. Our plant was discovered by Allan Cunningham at Whangaroa in November, 1828, and was described by him in his "Precursor to the New Zealand Flora" under the name which it now bears, *Ixerba* being an anagram of *Brexia*, its relationship to which was recognized by Cunningham. It was also gathered by Mr. Colenso and most subsequent botanists, but has usually been considered to be somewhat rare. This, however, is hardly correct, for in point of fact there is no forest district of any size to the north of the East Cape on the one side, and Kawhia on the other, where it is not plentiful on the crests of hilly ranges or of isolated peaks. It is not, however, frequently seen on the outskirts of the forest, which is possibly the reason for the misconception. It attains its northern limit on the Maungataniwha Ranges and near Kaitaia, in Mongonui County; while the most southern station of which I have precise knowledge is northern Hawke's Bay, where it was observed by Mr. A. Hamilton. It is said to have been gathered by Mr. Bidwill in the Wellington District, but does not seem to have been noticed by later collectors.

Few New Zealand trees surpass the subject of this plate in grace and attractiveness. Its handsome mode of growth, which has been compared with the northern *Arbutus*, its elegant foliage, and its conspicuous white flowers, often produced in great abundance, constitute it a really beautiful plant. It is worth mention that it is one of the few trees for which the Maoris had a special name for the flowers alone, which they called *whakou*. In olden times they were strung into necklaces and garlands, somewhat in the same way that the Polynesians at the present time use the flowers of *Fagraea Berteriana* and other plants, and were worn as personal adornments on gala-days and festivals.

PLATE 40. *Ixerba brexioides*, drawn from specimens collected on the Little Barrier Island. Fig. 1, margin of leaf ($\times 2$); 2, flower-bud ($\times 2$); 3, flower with the petals removed, showing the stamens, the large fleshy and bluntly lobed disc, and the ovary with style ($\times 2$); 4, petal ($\times 2$); 5 and 6, front and back view of anthers ($\times 4$); 7, longitudinal section of the ovary, showing the position of the ovules ($\times 4$); 8, transverse section of ovary ($\times 4$); 9, ripe fruit (natural size); 10, seed ($\times 2$); 11, embryo removed from the seed ($\times 3$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

CARPODETUS SERRATUS, Forst.

PLATE 41.—CARPODETUS SERRATUS.

(THE PUTAPUTAWETA.)

FAMILY SAXIFRAGACEÆ.]

[GENUS CARPODETUS, FORST.

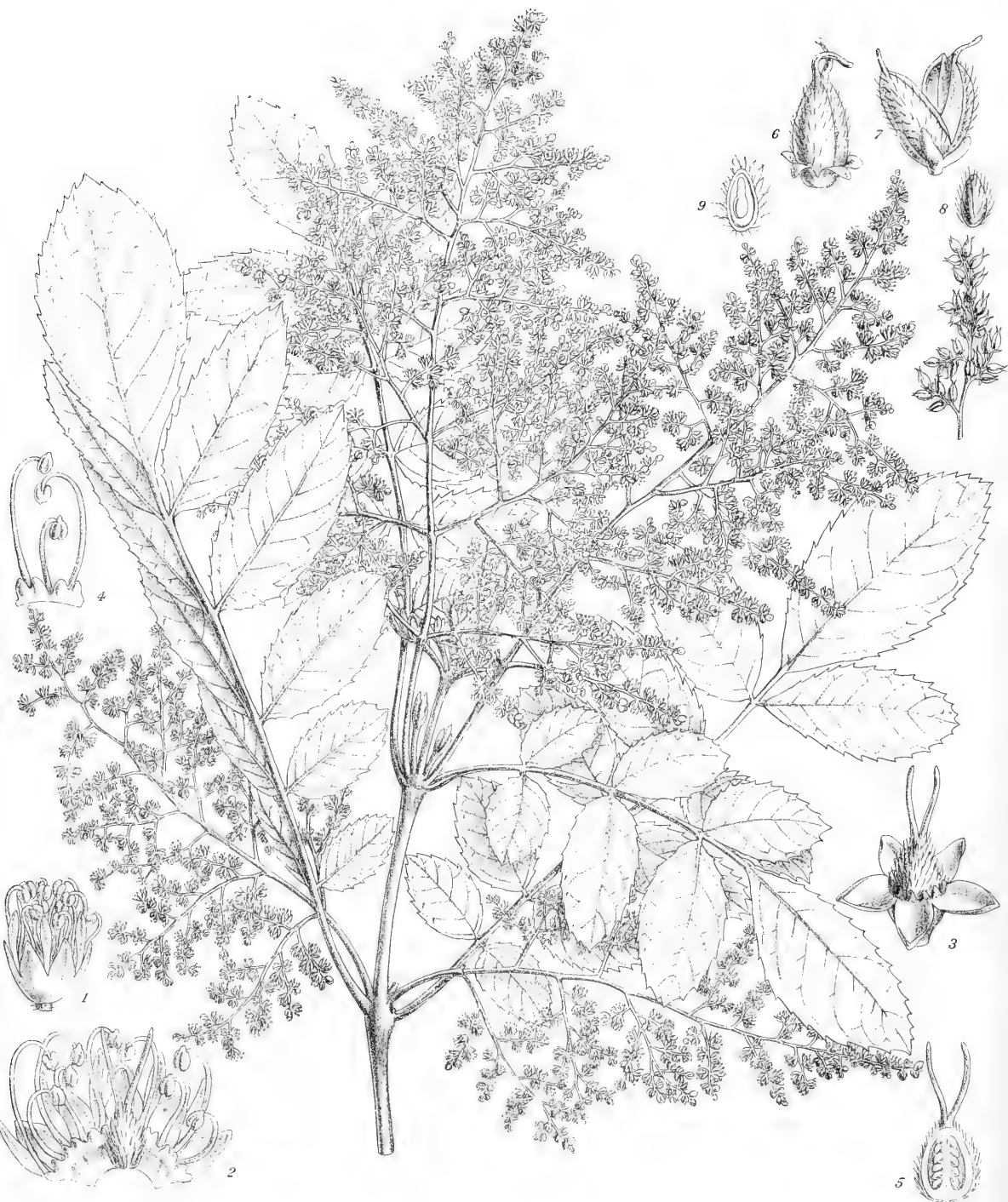
Carpodetus serratus, *Forst. Char. Gen.* 34, t. 17A; *Cheesem. Man. N.Z. Fl.* 137.

This plant was first collected by Banks and Solander at Totaranui (Queen Charlotte Sound) during Cook's first visit to New Zealand, but as their specimens did not show either flowers or fruit they were unable to indicate its affinities. It was again met with in the same locality by Forster in Cook's second voyage; and as on this occasion both flowers and fruit were observed he was able to publish the plant in his "Characteres Generum" under the name of *Carpodetus serratus*. But his description is very meagre, and the plate so badly executed as to give little idea of the characters of the genus. A much better description, drawn up from Forster's specimens, appears in A. Richard's "Essai d'une Flore de la Nouvelle Zélande." Since then *Carpodetus* has been shown to be pretty generally distributed throughout the Dominion, from the North Cape to Stewart Island, and from sea-level to nearly 3,000 ft. altitude.

Like *Ixerba*, *Carpodetus* is a monotypic genus confined to New Zealand. Its affinities have been a matter of discussion, but botanists are now generally agreed that it belongs to the tribe *Escalloniæ*, and it is usually placed near the New Caledonian and Australian genus *Argophyllum*, to which in fact it is very closely allied.

Carpodetus is a small tree, sometimes 30 ft. in height, with a trunk 6 in. to 9 in. in diameter. The foliage is curiously blotched or marbled with brown or yellowish markings, and the flowers are white and fragrant. The timber is strong and tough, but, unfortunately, by no means durable. It is frequently perforated in all directions by large galleries, probably made by the larvæ of wood-boring *Lepidoptera*, and these borings often form a secure home for the weta (*Deinacrida thoracica*), a large and repulsive-looking orthopterous insect. According to Mr. Elsdon Best, the name applied to *Carpodetus* in the Urewera district is Kaiweta, or "weta-food," the Maoris assuming that the wetas construct the galleries in which they are so often found.

PLATE 41. *Carpodetus serratus*, drawn from specimens collected in the vicinity of Auckland. Fig. 1, flower-bud ($\times 4$); 2, flower ($\times 4$); 3, calyx, with ovary and style ($\times 5$); 4 and 5, front and back view of stamens ($\times 8$); 6, longitudinal section of ovary ($\times 5$); 7, transverse section of ovary ($\times 5$); 8, fruit ($\times 3$); 9, section of fruit, showing seeds ($\times 3$); 10, seeds ($\times 5$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp

ACKAMA ROSAEFOLIA, A. Cunn.

PLATE 42.—ACKAMA ROSÆFOLIA.

FAMILY SAXIFRAGACEÆ.]

[GENUS ACKAMA, A. CUNN.]

Ackama rosæfolia, A. Cunn. *Precur.* n. 520 : *Cheesem. Man. N.Z. Fl.* 137.

This is one of the many discoveries made by the indefatigable Allan Cunningham during his first visit to New Zealand, made in the year 1826. At that time all travelling had to be done on foot, along devious Maori tracks leading over steep hills and passing through dense forests, and often had to be performed under circumstances involving great privation and no little danger. His first specimens were collected in the Hokianga district, a locality where eight years later it was again met with by his brother, R. Cunningham. Cunningham recognized the distinctness of the plant, and in his "Precursor" established the genus *Ackama* for its reception, the name being a not very successful anagram of its Maori name makamaka. Subsequent botanists have repeatedly gathered it, but its range is exceedingly confined. Its northern limit is the undulating country between Kaitaia and Mongonui, from whence it stretches southwards almost as far as Whangarei. East and west it extends from the Bay of Islands to Hokianga. Even in this limited area it is nowhere abundant, and in many localities is decidedly rare.

The genus *Ackama* has long been supposed to be limited to two species—one from New Zealand, the other from northern New South Wales. Lately, however, a third species (*A. Nymanii*, K. Schum.) has been described from New Guinea. As a genus it is very closely related to *Weinmannia*, differing mainly in the valvate calyx and paniculate inflorescence. In *Weinmannia* the inflorescence is invariably racemose, and the calyx is imbricate.

Ackama rosæfolia is a handsome tree 20 ft. to 40 ft. high, with a trunk 1 ft. to 2 ft. in diameter. At present it is not in cultivation, but it is well worth establishing in gardens and plantations in the northern portion of the Dominion. It is said to be of rapid growth, and in habit and foliage is most attractive. The leaves are much more graceful in shape than those of its near ally *Weinmannia sylvicola*, and the colour a much more pleasant shade of green. Nothing is known of the value of the timber, but the bark has been used for tanning.

PLATE 42. *Ackama rosæfolia*, drawn from specimens gathered by Mr. R. H. Matthews at Kaitaia, Mongonui County. Fig. 1, hermaphrodite flower; 2, the same laid open; 3, female flower, with the petals removed; 4, portion of the perigynous disc, with 3 stamens; 5, section of ovary; 6, fruit; 7, fruit in a dehiscent state; 8, seed; 9, section of seed, showing embryo. (All enlarged.)



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

WEINMANNIA RACEMOSA, Linn. f.

PLATE 43.—WEINMANNIA RACEMOSA.

FAMILY SAXIFRAGACEÆ.]

[GENUS WEINMANNIA, LINN.

Weinmannia racemosa, Linn. *J. Suppl.* 227; *Cheesem. Man. N.Z. Fl.* 139.

Weinmannia racemosa was first gathered by Banks and Solander in Queen Charlotte Sound (or Totaranui, as they called it) during Cook's first visit, and was fully described and figured in Solander's manuscript "Primitiæ Floræ Novæ Zelandiæ," a work which was never published. It was again collected by the Forsters in Cook's second voyage, and on the return of the expedition to Europe was published in the "Supplementum Plantarum" of the younger Linnæus, no doubt from information supplied by the Forsters, for it appeared under the same name in George Forster's "Prodromus," published a few years later. Since then it has been gathered in many localities in the middle and southern portions of the North Island, and throughout the South Island. It attains its northern limit, so far as is known, in the Kauaeranga Valley, Thames, and on the cliffs fringing the Waikato River near Hamilton. Its most southern station is in Stewart Island, where it is plentiful, often forming the chief portion of the lowland forest. Its altitudinal range is from sea-level to over 3,000 ft.

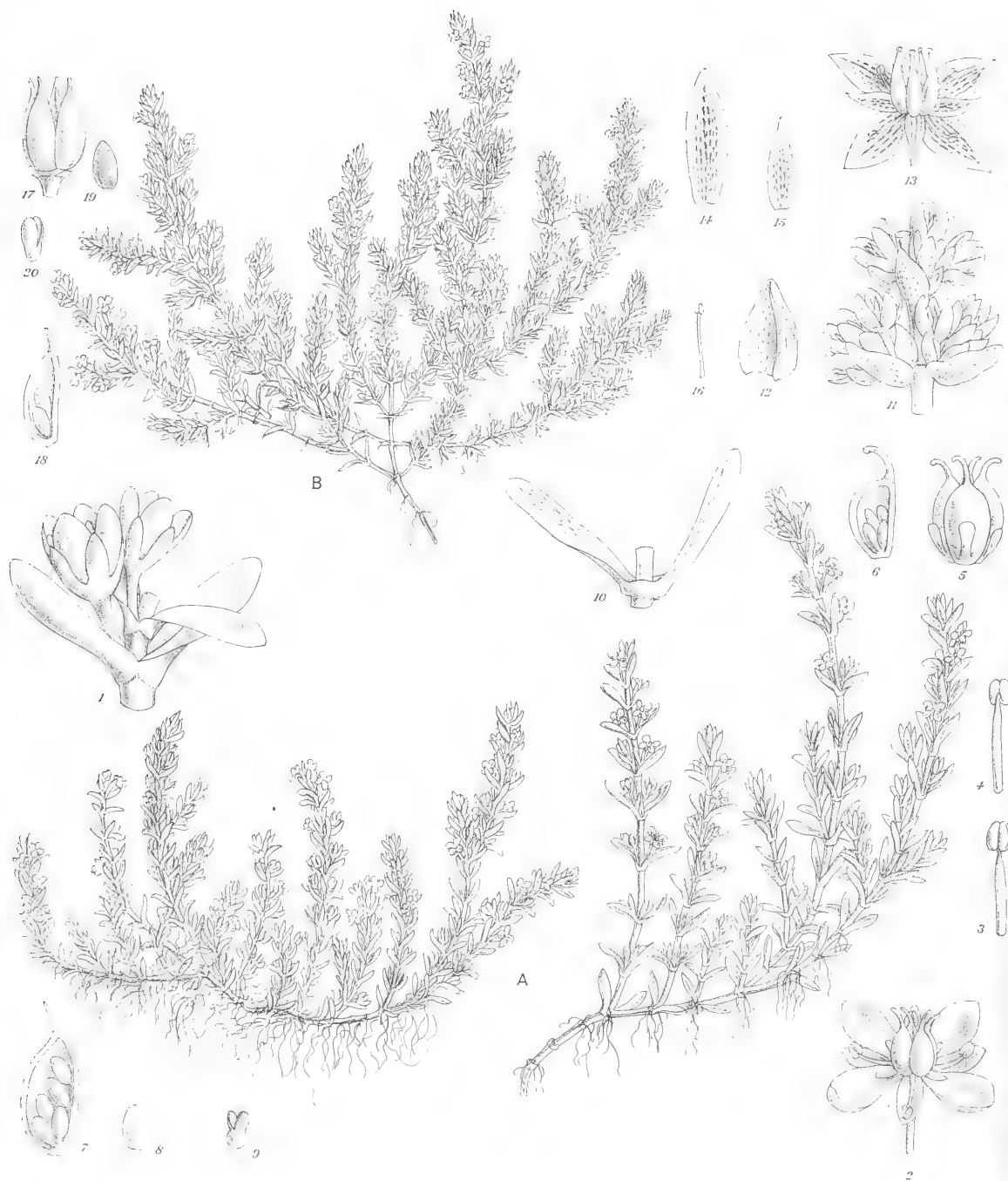
Weinmannia racemosa is a large forest-tree, often attaining a height of from 50 ft. to 80 ft., or even more, with a trunk 1 ft. to 4 ft. in diameter. It is usually known by its Maori names of tawhero or kamahi, the latter being principally used in the South Island. It is very closely allied to its congener *Weinmannia sylvicola*, the towai of the Maoris and settlers, and in the middle portion of the North Island the two are often confounded. But in *W. racemosa* the leaves of the mature trees are usually larger and 1-foliolate, and the branches are nearly glabrous; whereas in *W. sylvicola* the leaves are smaller, and 3-foliolate or even imparipinnate, and the branches are more or less pubescent. The leaves of young plants are generally pinnate in both species, and vary excessively, especially in *W. sylvicola*, where the number of leaflets may range from three to ten pairs.

The tawhero is so abundant in many forest districts that the timber has been applied to a variety of purposes, such as fencing-posts, house-blocks, tramway-sleepers, piles, &c. The general opinion, however, is that it is not durable where exposed to alternations of weather, although it may be serviceable where it is used under water, or altogether imbedded in the ground. It has been occasionally employed for inlaying and ornamental turning, and as it possesses considerable variety of colour and grain it might well be used to a greater extent.

The distribution of the genus *Weinmannia* presents some remarkable points. Over eighty well-established species are known, more than half of which are found in South America. Another centre of the genus is in Madagascar, from whence more than fifteen species have been described. The Pacific islands contain twelve or thirteen species, while Australia has four. The northern limit of the genus is in Mexico in the New World, and in the Philippine Islands in the Old.

PLATE 43. *Weinmannia racemosa*, drawn from specimens collected in the vicinity of Nelson. Fig. 1, a pair of flowers ($\times 4$); 2, stamen with glands ($\times 8$); 3, back view of stamen ($\times 8$); 4, pistil, with glands on the disc ($\times 8$); 5, longitudinal section of pistil ($\times 8$); 6, ripe fruit ($\times 3$); 7, seed ($\times 5$).





A. TILLAEA MOSCHATA, DC. 1-9.
 B. TILLAEA SIEBERIANA, Schultz, 10-20.

West, Newman imp.

M. Smith del
 J.N. Pritch lith

PLATE 44.—TILLÆA MOSCHATA AND TILLÆA SIEBERIANA.

FAMILY CRASSULACEÆ.]

[GENUS TILLÆA, LINN.

Tillæa moschata, D.C. *Prodr.* iii, 382; *Cheesem. Man. N.Z. Fl.* 140.

Tillæa Sieberiana, Schultz, *Mant.* iii, 345; *Cheesem. Man. N.Z. Fl.* 143.

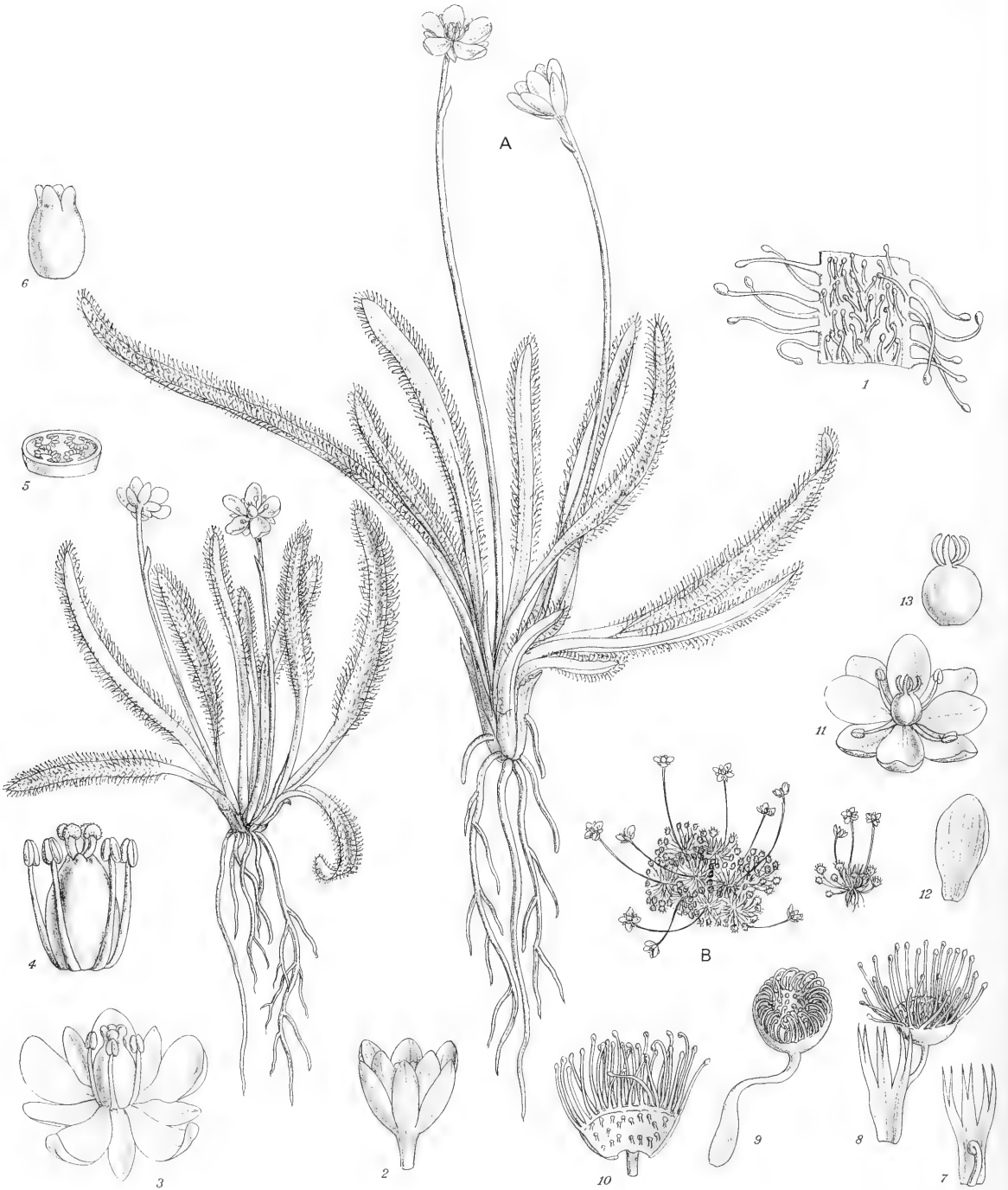
Tillæa is a cosmopolitan genus that has representatives in most parts of the world, but I do not know any country that contains so many species as New Zealand, no less than ten being credited to it in our floras. Of these, the most interesting is *Tillæa moschata*, which has a widespread distribution as a maritime plant in high southern latitudes. It stretches along the western coasts of South America from Chile to Cape Horn; is abundant on the Falkland Islands; is found on Kerguelen Island and Marion Island; and in New Zealand extends from Cook Strait to the Auckland and Campbell Islands, Antipodes Island, and Macquarie Island. It is thus one of those species found on most of those widely separated islands which girdle the globe between latitudes 50° and 60° S., and its distribution can therefore be described as being more or less circumpolar in its character.

As a species *T. moschata* can be separated from its New Zealand allies by its much greater size, its stems often exceeding 6 in. in length, its larger oblong-spathulate leaves, and larger flowers. It is purely a coastal plant, and is never found far from the sea. It should be remarked that it was first observed in both Fuegia and New Zealand by Banks and Solander during Cook's first voyage.

Tillæa Sieberiana is a very different species from the foregoing. It is smaller in all its parts, much more erect in its mode of growth, and usually more copiously branched. The flowers are aggregated in clusters mixed with minute leaves, and there are no scales at the base of the carpels. Like the previous species, it was first gathered by Banks and Solander, and is abundant through the North and South Islands, from the Three Kings Islands and the North Cape southwards to the south of Otago. Although common on coastal rocks, it is by no means confined to the vicinity of the sea, but extends into many inland districts, ascending to at least 2,000 ft. above sea-level. It is also widely distributed in Australia, ranging from Queensland to Victoria, Tasmania, South Australia, and West Australia, and has been recorded from several localities in the interior.

PLATE 44A. *Tillæa moschata*, drawn from specimens collected on the Auckland Islands by Mr. J. S. Tennant. Fig. 1, portion of inflorescence (× 5); 2, separate flower (× 5); 3 and 4, front and back view of stamens (× 8); 5, carpels, showing the scale at the base of each carpel (× 8); 6, section of carpel, showing ovules (× 8); 7, section of ripe carpel, showing seeds (× 10); 8, seed (× 12); 9, embryo (enlarged).

PLATE 44B. *Tillæa Sieberiana*, from specimens gathered at Mount Wellington, near Auckland. Fig. 10, pair of connate leaves (× 6); 11, portion of inflorescence (× 8); 12, bract (× 10); 13, single flower (× 10); 14, sepal (× 12); 15, petal (× 12); 16, stamen (× 14); 17, carpels (× 12); 18, section of carpel, showing ovules (× 12); 19, seed (enlarged); 20, embryo (enlarged).



M. Smith del.
J.N. Fitch lith

West, Newman imp.

A. *DROSERA ARCTURI*, Hook. 1-6.
B. *DROSERA PYGMAEA* D.C. 7-13.

PLATE 45.—DROSERA ARCTURI AND DROSERA PYGMÆA.

FAMILY DROSERACEÆ.]

[GENUS DROSERA, LINN.

Drosera Arcturi, Hook. in *Lond. Journ. Bot.* i (1834), 247; *Cheesem. Man. N.Z. Fl.* 145.

Drosera pygmæa, D.C. *Prodr.* i, 317; *Cheesem. Man. N.Z. Fl.* 145.

Six species of *Drosera* are found in New Zealand, and out of that number I have selected *D. Arcturi* and *D. pygmæa* for illustration. The first mentioned was originally collected by Mr. Colenso near the base of Tongariro during his adventurous journey—the first made by any European traveller—from Taupo to inland Patea, and from thence over the Ruahine Range to Hawke's Bay. (See his "Visits to the Ruahine Range," p. 39.) Since that time the plant has been observed in several localities on both sides of the central volcanic plateau, and on the Ruahine Range. It is much more abundant, however, in the South Island; where it is found in subalpine bogs from Nelson to Foveaux Strait, ranging from 2,000 ft. to 5,000 ft. altitude. It is also common in Stewart Island, where it descends almost to sea-level. It is also a native of south-eastern Australia, where it extends along the summits of the Australian Alps for a considerable distance; and of Tasmania, where it was originally discovered.

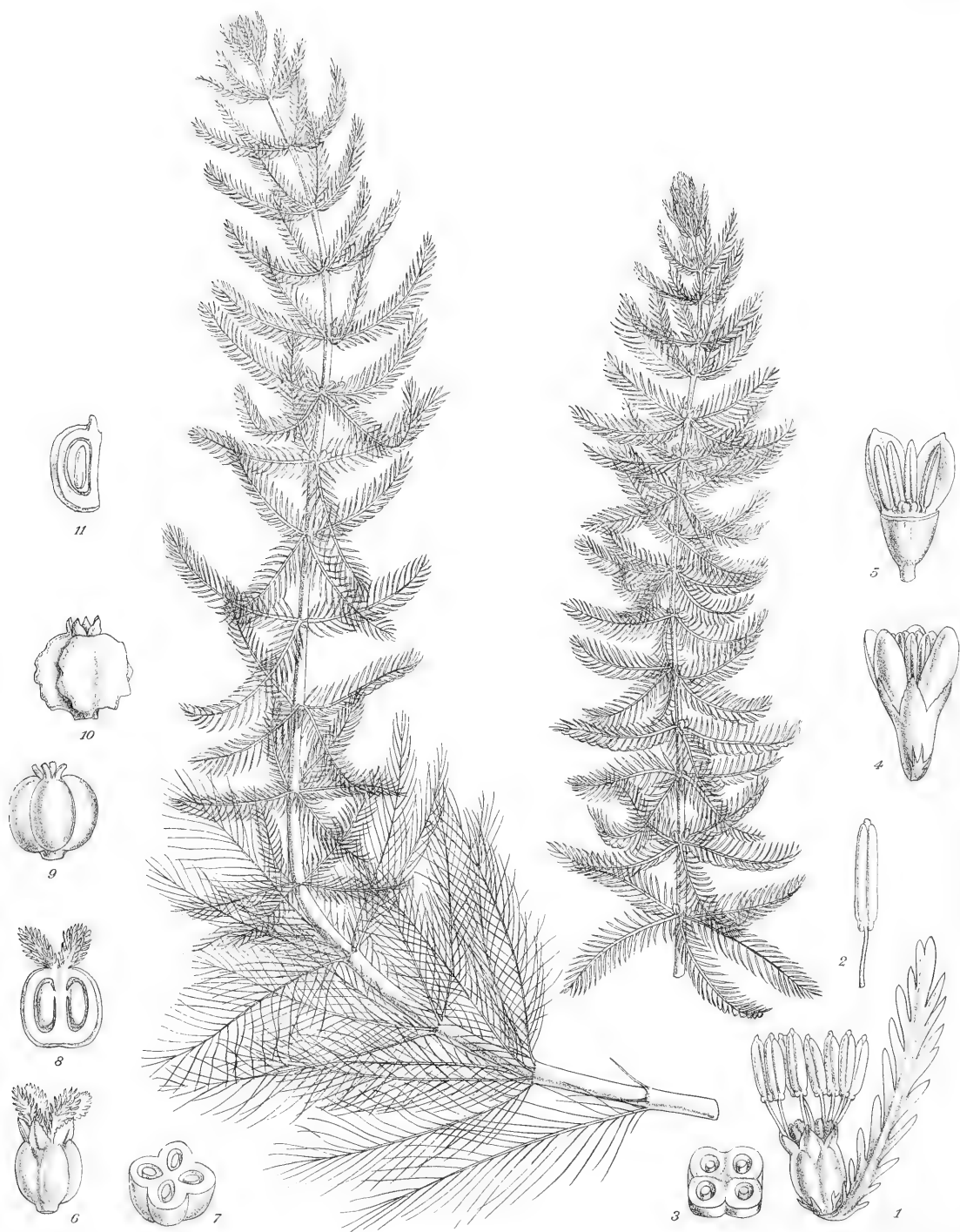
D. Arcturi, together with the New Zealand *D. stenopetala*, and the Fuegian *D. uniflora*, form a section of the genus called *Psychophila*, in which the stem is not bulbous, the leaves are dilated and sheathing at the base, the scape is 1-flowered, and the styles rarely multi-partite.

D. pygmæa is one of the smallest species of the genus, and at the same time one of the most curious and beautiful. It has a wide distribution in Australia, where it was first discovered, ranging from Queensland through New South Wales to Victoria, South Australia, and Tasmania. In New Zealand it was originally collected by Mr. Colenso in the North Cape Peninsula. In the "*Flora Novæ Zelandiæ*" the locality was given as "marshes near Cape Maria van Diemen," but Mr. Colenso personally informed me that he probably obtained it near Ahipara. For many years the plant was not refound: but in 1877 Mr. Kirk observed it on the Bluff Hill, Southland, a station separated from the previous one by almost the whole length of the Dominion. In 1896 I collected it in abundance at Te Paua, in Parengarenga Harbour, and a few years later it was discovered at Ahipara by Mr. R. H. Matthews and Mr. H. Carse—in all probability, not far from the route followed by Mr. Colenso in 1839.

D. pygmæa is very appropriately named, many specimens not exceeding $\frac{1}{4}$ in. in diameter. The leaves vary from $\frac{1}{10}$ in. to $\frac{1}{3}$ in. across, and the scape, with its solitary flower, is seldom more than $\frac{3}{4}$ in. in height. It is consequently very easily overlooked, which is probably the reason why it is not known from more localities. When once observed, however, the silvery cone of scarious stipules in the centre of the tiny leaf-rosettes enable the plant to be picked out of the adjacent vegetation with ease. (Since the above was written *D. pygmæa* has been collected by Mr. Phillips Turner at Waimarino, near the western base of Ruapehu, at an elevation of 2,000 ft.)

PLATE 45A. *Drosera Arcturi*, drawn from specimens gathered on Mount Sebastopol, Mount Cook district, at an elevation of 4,500 ft. Fig. 1, part of leaf, showing the irritable glandular hairs ($\times 4$); 2 and 3, flowers ($\times 3$); 4, flower with calyx and corolla removed ($\times 6$); 5, transverse section of ovary, showing the ovules arranged on parietal placentas ($\times 6$); 6, ripe fruit ($\times 4$).

PLATE 45B. *Drosera pygmæa*, from specimens collected at Parengarenga Harbour, North Cape district. Fig. 7, stipule, concealing the very young leaf ($\times 8$); 8, stipule, with fully mature leaf; 9, fully developed leaf ($\times 8$); 10, leaf laid open ($\times 10$); 11, flower ($\times 6$); 12, petal ($\times 8$); 13, ovary ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West Newman imp.

MYRIOPHYLLUM ROBUSTUM, Hook. f.

PLATE 46.—MYRIOPHYLLUM ROBUSTUM.

FAMILY HALORAGACEÆ.]

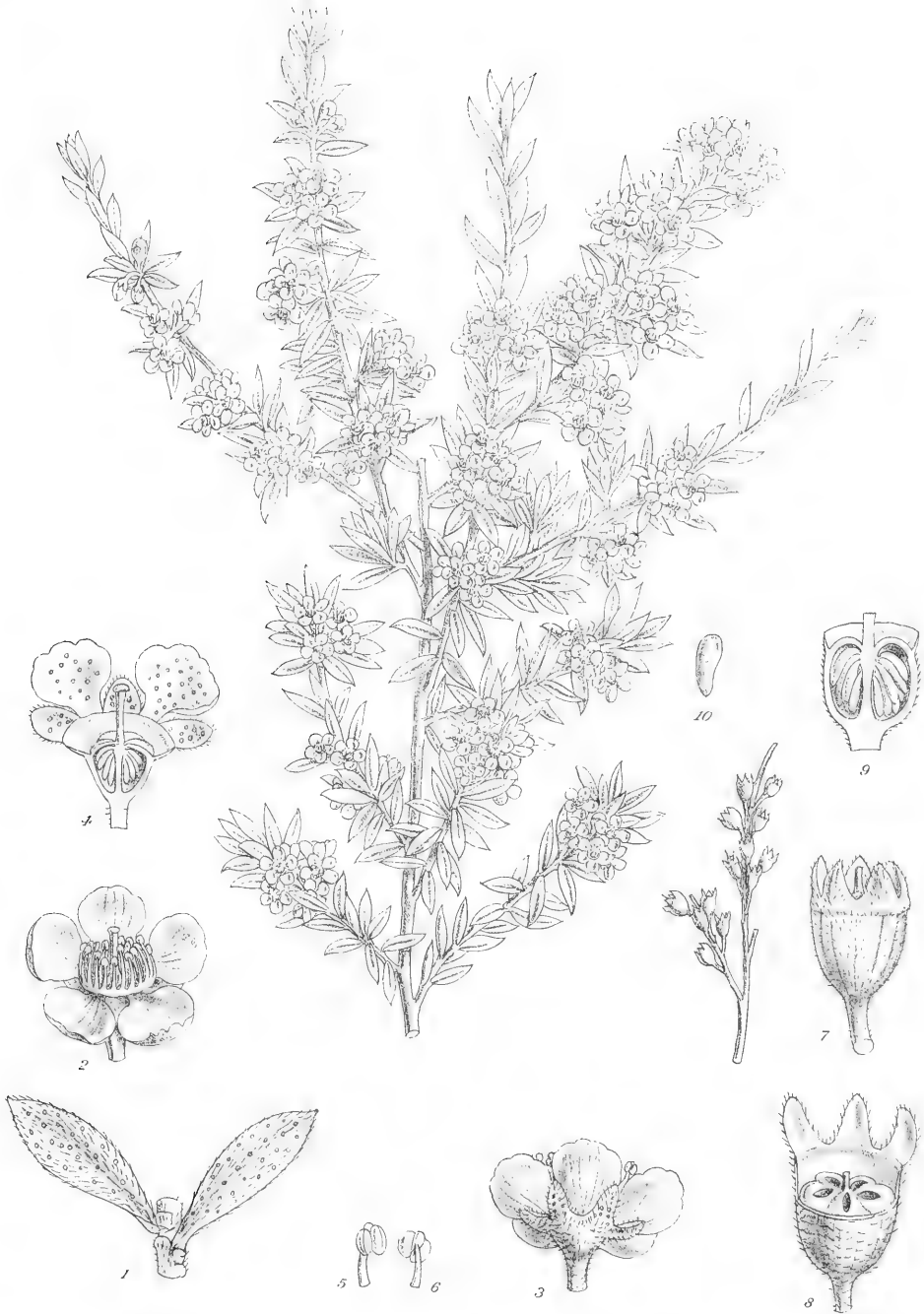
[GENUS MYRIOPHYLLUM, LINN.

Myriophyllum robustum, Hook. f. *Handb. N.Z. Fl.* 67; *Cheesem. Man. N.Z. Fl.* 151.

Myriophyllum robustum, which is by far the finest of the New Zealand species of the genus, was originally discovered by Mr. Colenso in some locality in the North Island, and has since been found in many lowland swamps or marshes from Ahipara and Mongonui southwards to Cook Strait. It is, however, far from being generally distributed, and is often absent from extensive areas apparently well adapted for it. Its chief centre of distribution is in the alluvial valleys of the Northern Wairoa, the Waikato, and the Thames Rivers; where, however, it is rapidly being destroyed either by the draining of the swamps or by the periodical burning of the vegetation therein. In these districts it can still be seen covering large stretches in swamps that are deeply covered with water in winter, but dry or nearly so in summer. Although occasionally seen in lakes or streams it is by no means either lacustrine or fluviatile to the same extent as its allies *M. elatinoides* and *M. variaefolium*. In the South Island it appears to be rare, although it has been recorded as far south as Awatere on the east coast, and Hokitika on the west.

M. robustum belongs to a section of the genus in which the whole of the leaves are verticillate and pectinately pinnatifid; and is closely allied to the northern *M. verticillatum*, which ranges through a large portion of Europe, northern Asia, and North America. It can be distinguished from *M. elatinoides* and *M. variaefolium* without the slightest difficulty by the much stouter and coarser habit, and by the upper leaves being verticillate as well as the lower. In addition to the above, the nuts are much larger and evidently tubercled.

PLATE 46. *Myriophyllum robustum*, drawn from specimens collected near Te Aroha, in the Thames Valley, and in the Waikato near Mercer. Fig. 1, hermaphrodite flower and leaf; 2, stamen; 3, transverse section of ovary; 4, male flower; 5, section of male flower; 6, female flower; 7, transverse section of ovary; 8, longitudinal section of ovary; 9, fruit without tubercles; 10, fruit with tubercles; 11, section of ripe carpel. (All enlarged.)



LEPTOSPERMUM SINCLAIRII, T. Kirk.

West. Newman imp.

PLATE 47.—LEPTOSPERMUM SINCLAIRII.

FAMILY MYRTACEÆ.]

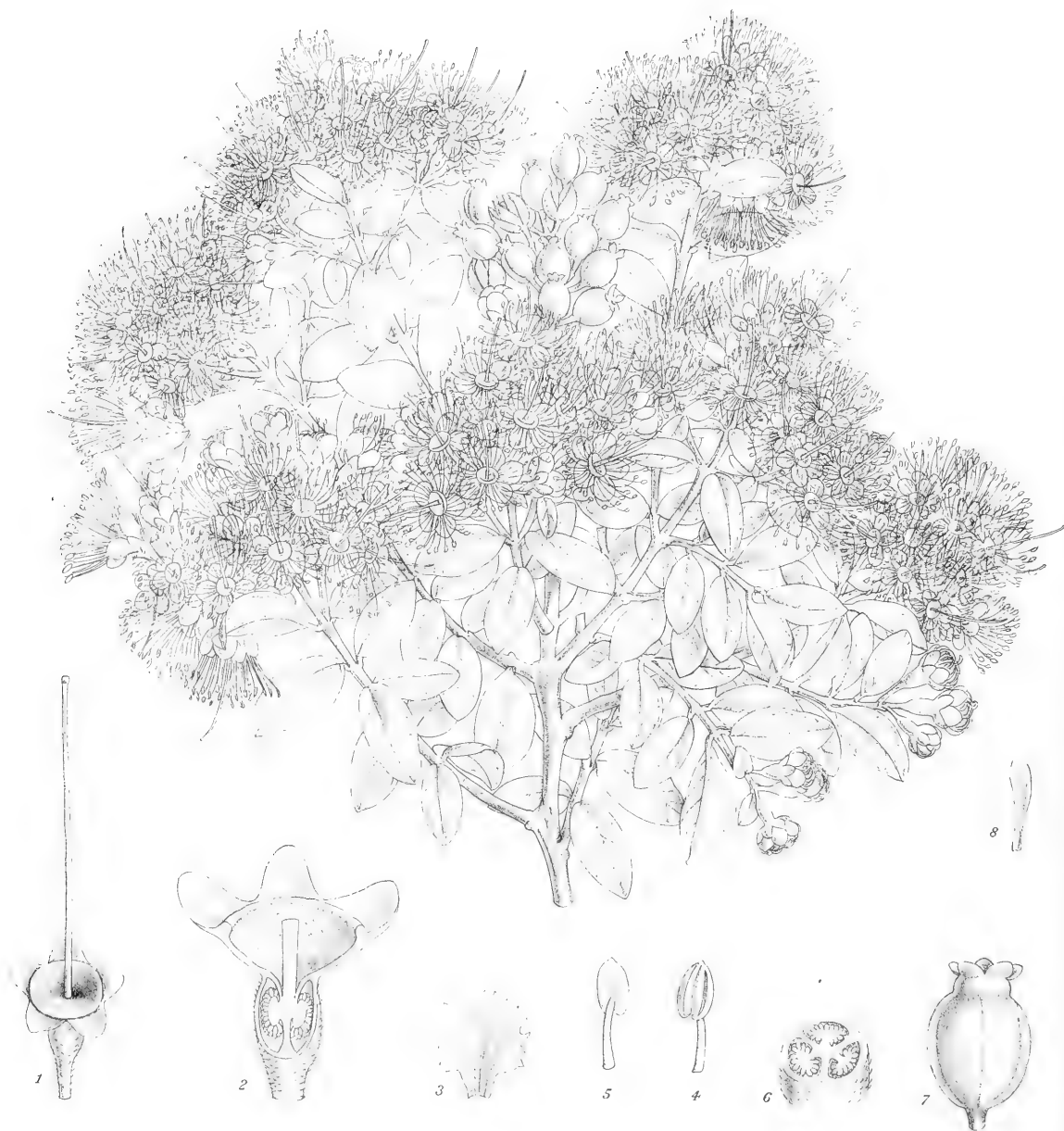
[GENUS LEPTOSPERMUM, FORST.

Leptospermum Sinclairii, T. Kirk, *Students' Fl.* 158; *Cheesem. Man. N.Z. Fl.* 161.

The first mention of this somewhat critical species that I am acquainted with is in Mr. Kirk's paper on the "Botany of the Great Barrier Island" (*Trans. N.Z. Inst.* i (1869), 146), where he refers to it under the name of *Leptospermum ericoides* var. *pubescens*, saying that it is "a prostrate or subprostrate shrub, sometimes 3 ft. high, at others appressed to the rock, like an alpine plant; leaves more or less pubescent and ciliated; flowers fragrant, produced in immense profusion, sometimes concealing the leaves; pedicels and calyx downy. This would make a valuable bedding plant for the culturist. It was originally observed on the island by the late Dr. Sinclair, but I am not aware of its occurrence elsewhere." In 1887, and again in 1889, I observed the same plant on the Three Kings Islands, but so far it has not been seen in any other localities. Its distinguishing characters, such as they are, lie in the smaller size, broader and flatter silky-hoary leaves, larger flowers, longer pedicels, and much more deeply sunk capsules. It must be admitted, however, that the plant is very near to small states of *L. ericoides*, which, as every New Zealand botanist knows, is an exceedingly variable plant responding very readily to changes in its environment. I cannot avoid the suspicion that the separation of our plant as a species will not be maintained.

In the Great Barrier Island *L. Sinclairii* principally occurs on rocky peaks, and is usually prostrate, or nearly so. On the Three Kings Islands I observed it mainly on declivities leading down to the cliffs on the northern side of the Great King. In this situation it was suberect, and the leaves were slightly narrower than in the Barrier plant. Both forms agreed in the immense profusion with which the flowers were produced, and in their delicious fragrance.

PLATE 47. *Leptospermum Sinclairii*, drawn from specimens collected on the Great Barrier Island by Mr. T. Kirk. Fig. 1, leaves; 2 and 3, flowers; 4, section of flower, with the stamens removed; 5 and 6, front and back view of anthers; 7, ripe fruit; 8, the same with a portion of the calyx removed; 9, longitudinal section of fruit; 10, seed. (All enlarged.)



M. Smith del.
J.N. Fitch lith.

METROSIDEROS DIFFUSA, Sm.

West, Newman imp.

PLATE 48.—METROSIDEROS DIFFUSA.

FAMILY MYRTACEÆ.]

[GENUS METROSIDEROS, BANKS.

Metrosideros diffusa, Smith in Trans. Linn. Soc. iii (1797), 268; Hook. f. Fl. Nov. Zel. i, 67; Cheesem. Man. N.Z. Fl. 164.

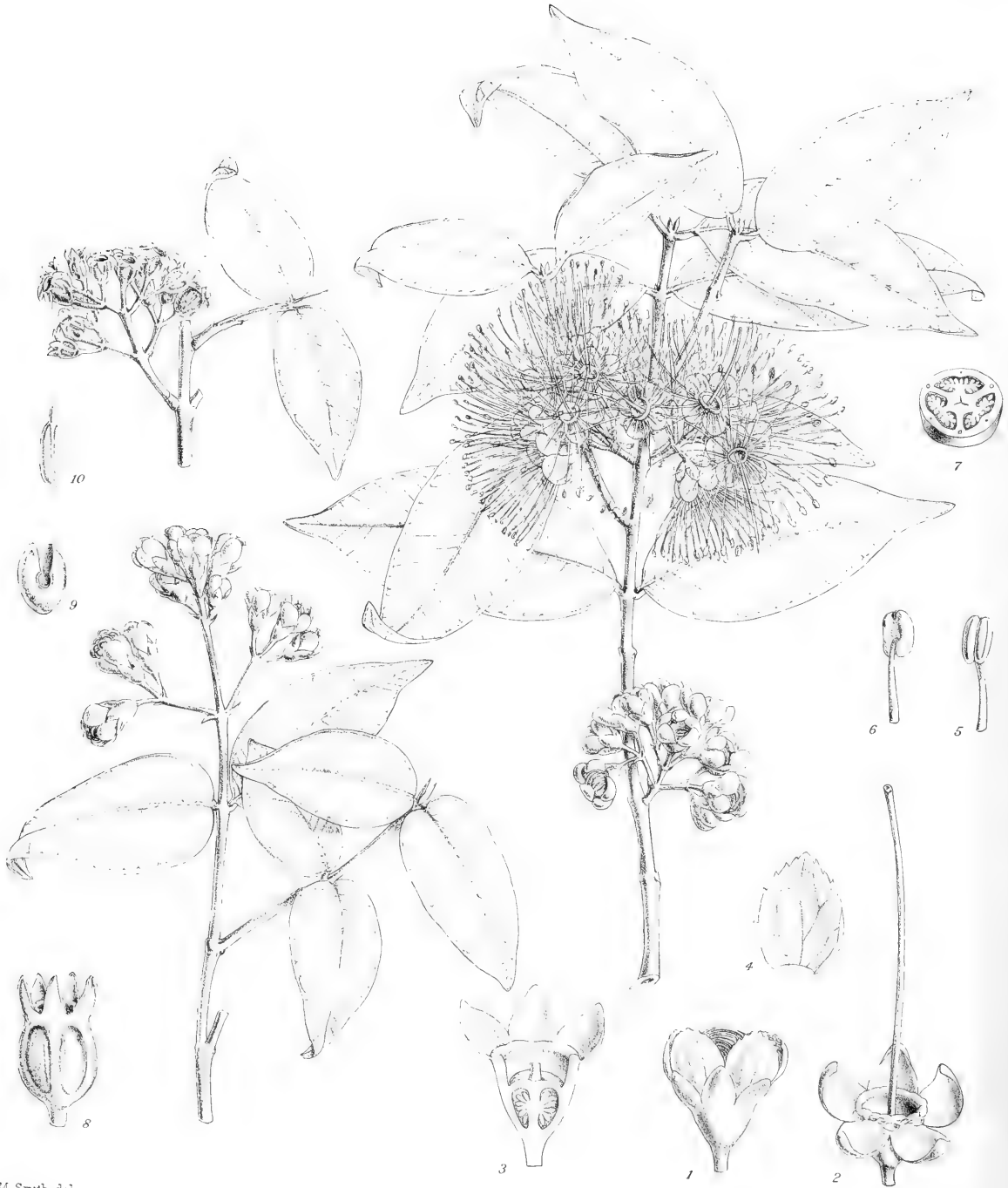
The New Zealand species of *Metrosideros* can be arranged in three categories according to their mode of growth. In one division, represented by the northern rata (*M. robusta*) alone, the plant starts its life as an epiphyte high up in the branches of some tall forest-tree, and sends aerial roots down to the ground, which ultimately coalesce to form an irregular stem often of enormous size. A second class comprises species like the southern rata (*M. lucida*), the pohutukawa (*M. tomentosa*), and one or two others, which in the ordinary manner grow into tall trees with stout stems and spreading branches. Lastly, there are quite a number of species best described as woody climbers, which often reach the tops of the tallest forest-trees, but never produce an erect tree-like trunk. To this division the subject of this plate belongs.

Metrosideros diffusa, when seen in full bloom, is probably the most brilliant of the species. The flowers are a much brighter crimson than those of the northern rata (*M. robusta*) and pohutukawa (*M. tomentosa*), and are so abundantly produced as almost to conceal the leaves. When climbing up the trunk of a rimu or other tall forest tree, and laden with flowers, it presents the appearance of a veritable pillar of flame, and such specimens are often conspicuous from afar. Unfortunately, it is not a common species, although occurring sparingly in most forests of any size from Mongonui and Kaitaia southwards to the East Cape and Taranaki. It has been recorded from the Tararua Range, on the authority of the late Mr. Mantell; but I have seen no specimens. Although of slow growth it is by no means difficult to establish in a garden, and is well worth general cultivation.

I am not at all sure that the name *diffusa* has been correctly applied to the plant figured herewith. The originator of the specific name was George Forster, who in his "Prodromus" published a "*Melaleuca diffusa*," giving as a diagnosis the words "foliis oppositis ovatis acuminatis, pedunculis ramis cymosis." Now, the term "acuminate" cannot be correctly applied to the leaves of our plant, in which they are obtuse or subacute, as a glance at the plate will show. Further, as our plant is confined to the North Island it is hard to see how it could be collected by Forster, who never landed on any part of it. He does not mention the exact locality in which his specimens were obtained, but there can be little doubt that they were gathered in Queen Charlotte Sound, where most of his collecting was done. In all probability his plant is identical with the species usually known as *M. hypericifolia*. The shape of the leaves and character of the inflorescence suit his diagnosis, and the species is known to occur in the locality, where, in fact, it was gathered by Banks and Solander during Cook's first voyage. I regret that I have no opportunity of examining a set of Forster's plants, which would probably decide the question.

It may be remarked that, although the descriptions of *M. diffusa* given by Hooker in the "Flora" and the "Handbook" clearly refer to the plant illustrated herewith, there must have been some confusion in his mind respecting it. This is proved by the fact that he gives Banks and Solander's *M. myrtifolia* as a synonym of *M. diffusa*. But Solander's description in his "Primitiæ Floræ Novæ Zelandiæ" undoubtedly represents *M. hypericifolia*, and the specimens in the set of Banksian plants presented to the Dominion by the trustees of the British Museum are indisputably that species.

PLATE 48. *Metrosideros diffusa*, drawn from specimens collected at Mount Wellington, near Auckland. Fig. 1, calyx and style ($\times 4$); 2, longitudinal section of calyx and ovary ($\times 4$); 3, petal ($\times 4$); 4 and 5, front and back view of anthers ($\times 6$); 6, transverse section of ovary ($\times 5$); 7, ripe fruit ($\times 3$); 8, seed (enlarged).



M. Smith del
J. N. Fitch lith.

West, Newman imp.

METROSIDEROS PARKINSONII, Buch.

PLATE 49.—METROSIDEROS PARKINSONII.

FAMILY MYRTACEÆ.]

[GENUS METROSIDEROS, BANKS.

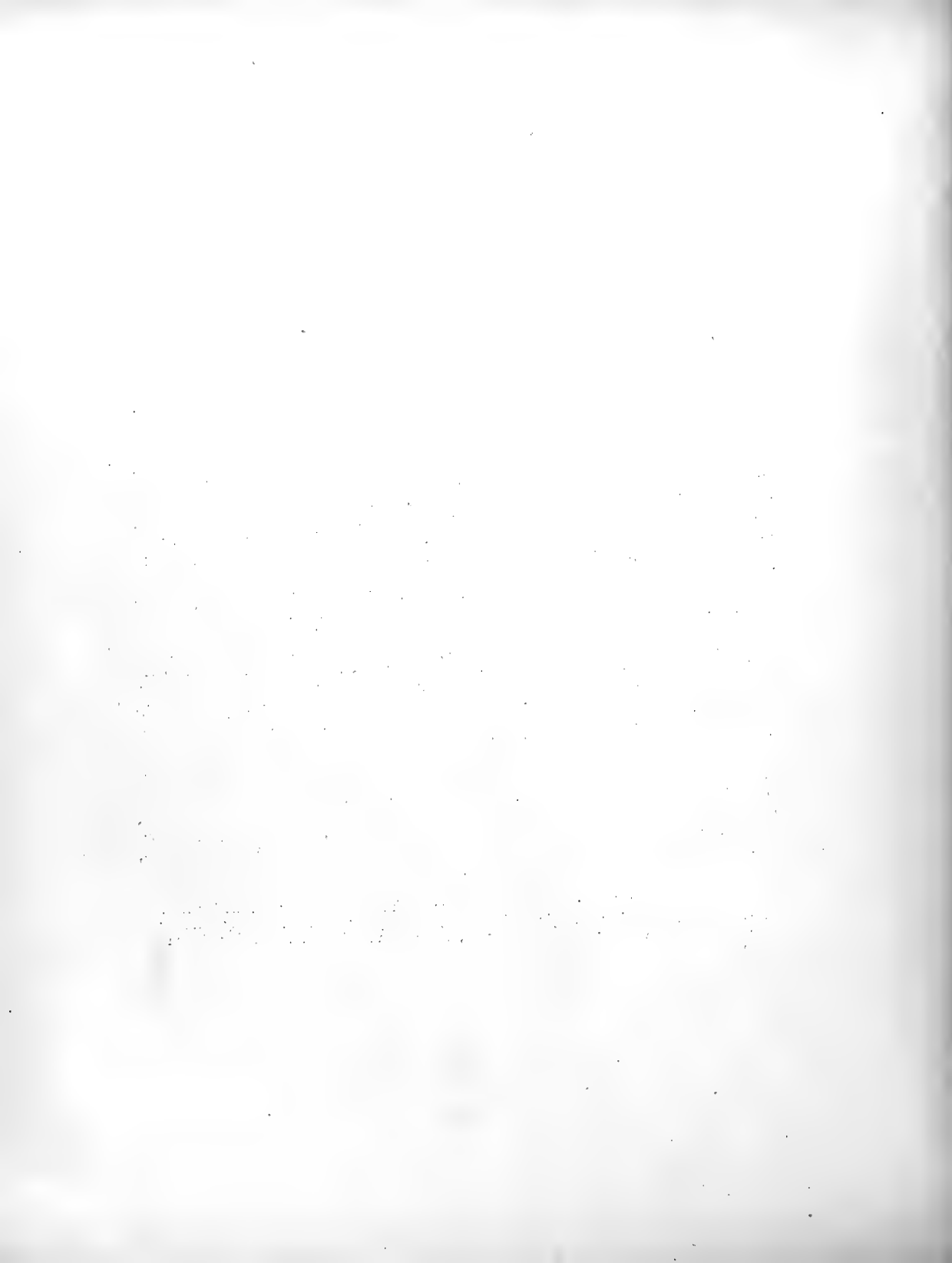
Metrosideros Parkinsonii, *Buch. in Trans. N.Z. Inst.* xv (1883), 339, t. 28, f. 2; *Cheesem. Man. N.Z. Fl.* 163.

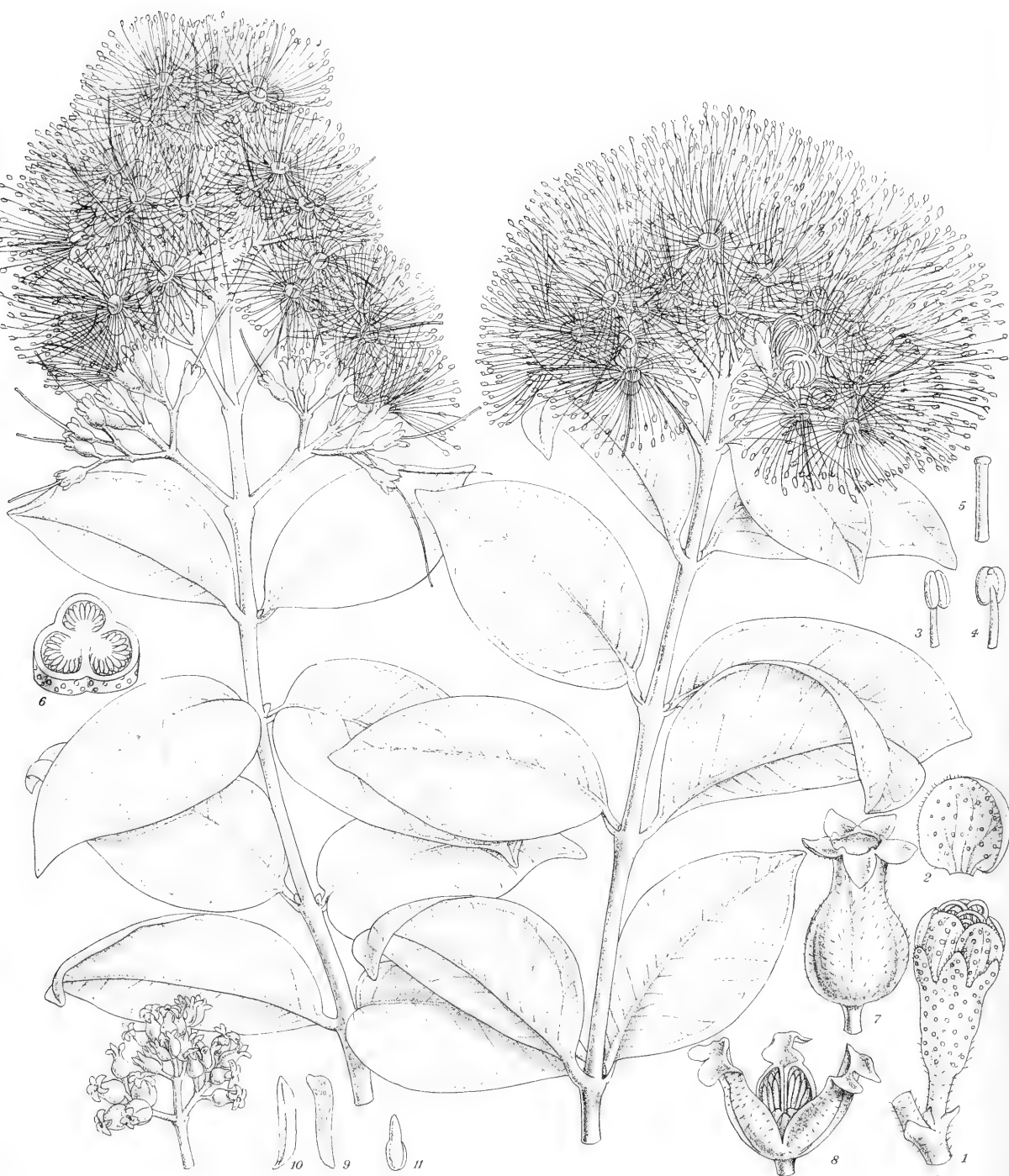
Metrosideros Parkinsonii has by far the most restricted range of any of the New Zealand species, being confined to the north-west portion of the South Island, stretching from Collingwood southwards to Mount Rochfort, the lower portion of the Buller Valley, and the northern termination of the Paparoa Range. It descends almost to sea-level in the Buller Valley, and ascends to nearly 3,000 ft. on Mount Rochfort. According to Mr. Townson, it is at times a straggling shrub, at others a small tree from 20 ft. to 25 ft. in height. Its brilliant crimson flowers render it a very conspicuous object during the flowering season.

According to Mr. Kirk, it was originally discovered by Mr. W. S. Hayward on the mountains behind Collingwood, but it was first made known to botanical science through specimens gathered in the same district by Mr. H. H. Travers, and communicated by him to Mr. Buchanan, who described and figured it in the "Transactions of the New Zealand Institute" for 1882. It has since been found in several localities in north-west Nelson by Mr. Dall, by Mr. Kingsley in the Buller Valley, and by Mr. Townson on Mount Rochfort, Mount Frederic, and on the spurs of the Paparoa Range. I am indebted to the last-named gentleman for the specimens from which this plate has been prepared.

The distribution of *Metrosideros* in New Zealand is mainly northern, although one species (*M. lucida*) advances as far south as the Auckland Islands, where it constitutes the principal tree. In the South Island the species are mainly found on the western side of the Island. This is well seen in the neighbourhood of Westport, where no less than six species occur on the seaward side of the Mount Rochfort Range, their names being *M. florida*, *M. lucida*, *M. hypericifolia*, *M. robusta*, *M. scandens*, and the subject of this plate.

PLATE 49. *Metrosideros Parkinsonii*, drawn from specimens collected by Mr. W. Townson on Mount Rochfort, near Westport. Fig. 1, flower-bud, not yet fully expanded; 2, calyx and style; 3, longitudinal section of calyx-tube and ovary; 4, petal; 5 and 6, front and back view of stamens; 7, transverse section of ovary; 8, ripe fruit; 9, cartilaginous endocarp; 10, seed. (All enlarged.)





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

METROSIDEROS. ALBIFLORA, Solander

PLATE 50.—METROSIDEROS ALBIFLORA.

FAMILY MYRTACEÆ.]

[GENUS METROSIDEROS, BANKS.

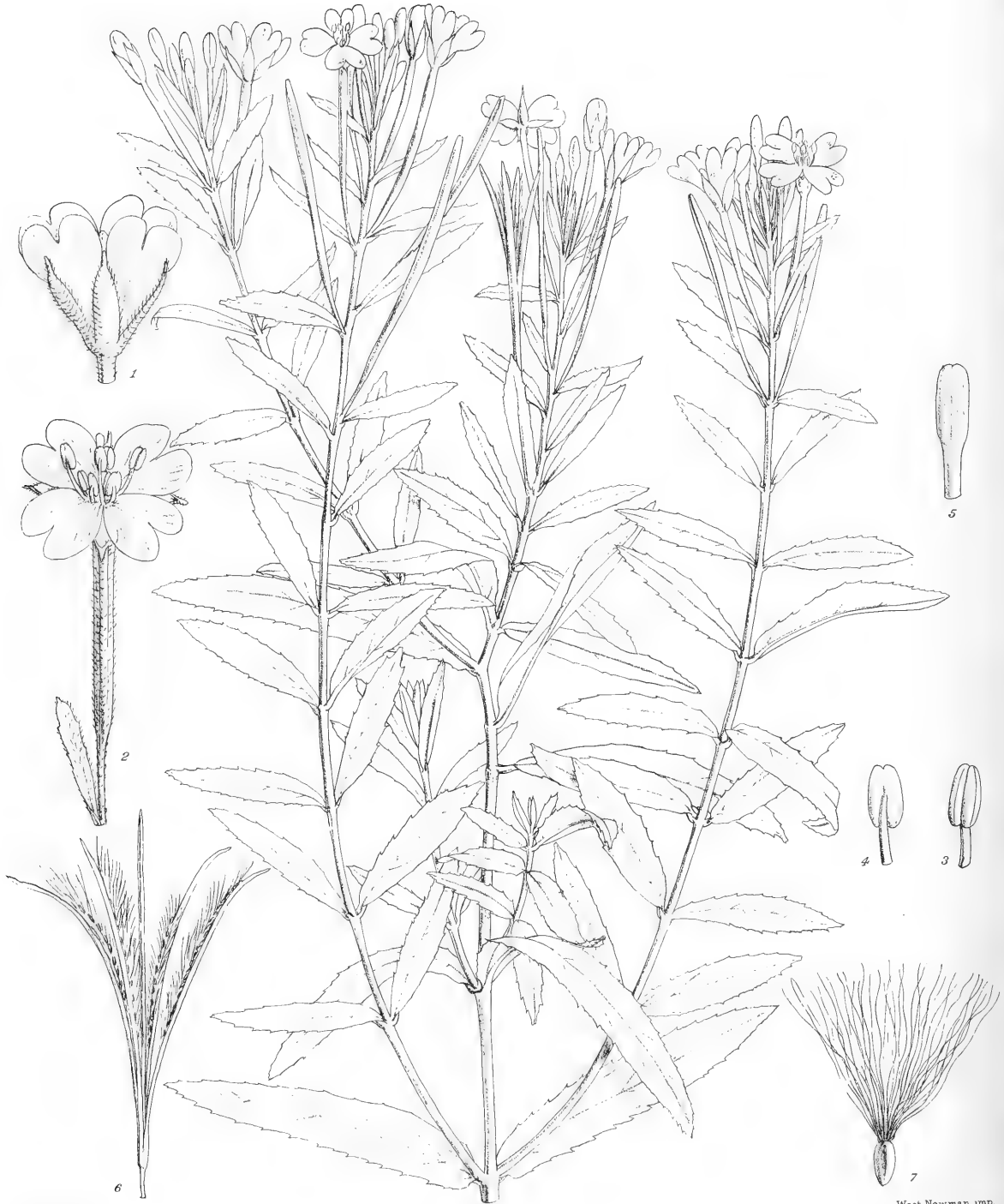
Metrosideros albiflora, Sol. ex Gaertn. *Fruet.* i, 172, t. 34, f. 11; *Cheesem. Man. N.Z. Fl.* 164.

One of the most handsome species of the genus, at once recognized by the large broad leaves and conspicuous panicles of white flowers. For its discovery we have to go back to the year 1769, when it was collected by Banks and Solander at Mercury Bay during Cook's first voyage, a locality where it is still abundant in those remnants of forest which have escaped the hands of the sawmiller. Solander gave a full description of it in his unpublished "*Primitiæ Floræ Novæ Zelandiæ*," accompanied by an excellent plate. It does not seem to have been again noticed until 1826, when Allan Cunningham collected it at Whangaroa, unfortunately making the mistake of referring it to Forster's *M. diffusa*. Shortly afterwards it was obtained by Mr. Edgerly at Hokianga, and by others in various localities in the northern half of the North Island. The most southern locality that I am personally acquainted with is in the Bay of Plenty. Mr Kirk, in his "*Notes on the Botany of the East Cape District*" (*Trans. N.Z. Inst.* xxix (1897), 520), records it from thence, on the authority of Banks and Solander; but, I think, erroneously, for the only locality given by Solander is that of "Opuragi," or Mercury Bay. On the west coast of the North Island I do not know of any station to the south of the Kaipara Harbour. Its northern limit appears to be on the Maungataniwha Ranges near Kaitia. Its altitudinal range is from 250 ft. to 2,800 ft.

The distribution of *Metrosideros albiflora*, both latitudinal and altitudinal, is very similar to that of the kauri (*Agathis australis*). But it is far more local, and is consequently absent from many localities where the kauri is abundant. Nevertheless, it cannot be denied that the *Metrosideros* has a special predilection for kauri forests, and is more frequent therein than in ordinary forest. In other words, it belongs to the kauri association, an assemblage of species which on the whole always appears where the kauri is predominant. Common members of this association are *Astelia trinervia*, *Gahnia xanthocarpa*, *Alseuosmia macrophylla*, *Dracophyllum latifolium*, *Senecio Kirkii*, *Lomaria Fraseri* and *L. discolor*, and others which cannot be particularized here.

Metrosideros is more highly developed in New Zealand than in any other country, and assumes a much more diversified form and habit of growth. No other country has climbing species, and no other country possesses a species which builds a lofty trunk for itself by the coalescence of aerial roots. It has been suggested that the climbing species have arisen on account of the presence of a moist atmosphere and equable climate. But this theory does not explain why the Polynesian and Malayan species, placed in a climate even more humid and equable, have not developed in a similar direction.

PLATE 50. *Metrosideros albiflora*, drawn from specimens collected by Mr. A. Gordon at Ruatangata, Whangarei. Fig. 1, flower-bud (×4); 2, petal (×4); 3 and 4, front and back view of anthers (×4); 5, upper part of style and stigma (×4); 6, section of ovary (×4); 7, ripe fruit (×4); 8, the same, showing dehiscence by three valves (×4); 9, abortive seed (×5); 10, seed (×6); 11, embryo (×8).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

EPILOBIUM PALLIDIFLORUM, Soland.

PLATE 51.—EPILOBIUM PALLIDIFLORUM.

FAMILY ONAGRACEÆ.]

[GENUS EPILOBIUM, LINN.

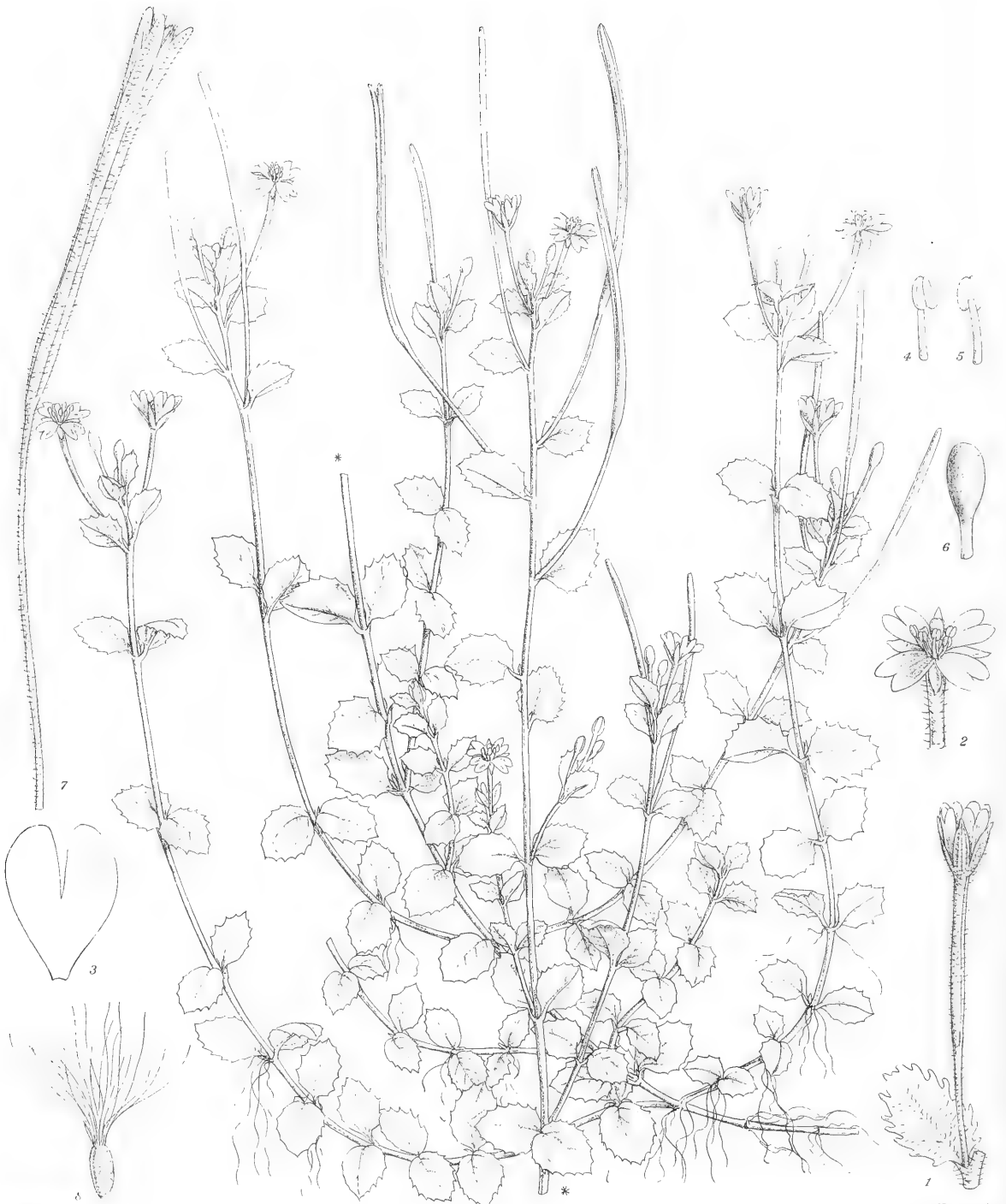
Epilobium pallidiflorum, Sol. ex A. Cunn. *Precur.* n. 550; *Cheesem. Man. N.Z. Fl.* 173.

The genus *Epilobium* is remarkably well represented in New Zealand, about thirty species being known. In whatever country the genus may exist, its species for the most part present an extraordinary amount of variation. In the Northern Hemisphere this has resulted in the creation of a multiplicity of so-called "species" differing only in slight and inconstant characters, and so closely linked to one another as to make their discrimination a matter of great difficulty, even those experts who have studied the genus being far from agreement. In New Zealand the species are equally variable, but so far they have been treated on fairly conservative lines, and but few attempts have been made to follow the practice of the northern botanists. In the subject of the present plate, however, we have a species possessing such strongly marked characters that there can be no difficulty in separating it from any of its allies.

Epilobium pallidiflorum was one of the many plants observed during Cook's first visit to New Zealand in 1769. It was originally collected by Banks and Solander in Mercury Bay (or Opuragi, as Cook called it), and was described by Solander in his manuscripts under the name it now bears. The species, however, was not actually published until 1839, when it appeared in Allan Cunningham's "Precursor." Since its original discovery it has been found to have a wide range in marshy places, along the banks of rivers, &c., and is now known to be plentiful in such localities from the North Cape to Foveaux Strait. Its southern limit is in Stewart Island, where it has been recently detected by Dr. Cockayne. It is purely a lowland plant, and I have not seen it at a greater elevation than 1,500 ft. It also occurs in Victoria and South Australia, and is abundant in Tasmania.

As already remarked, *Epilobium pallidiflorum* is a remarkably distinct species. It can be recognized at a glance by its great size—I have seen specimens quite 4 ft. in height—by its long acute leaves, and by its large white flowers. It is a great ornament in the swamps of the Lower Waikato district, where it grows in the utmost luxuriance along the banks of the streams which flow through the swamps, mixed with such plants as *Phormium*, *Calystegia sepium*, and various sedges.

PLATE 51. *Epilobium pallidiflorum*, drawn from specimens collected at St. John's Lake, near Auckland. Fig. 1, flower ($\times 2\frac{1}{2}$); 2, flower with ovary and bract ($\times 2\frac{1}{2}$); 3 and 4, anthers, front and back view ($\times 5$); 5, stigma ($\times 5$); 6, ripe capsule ($\times 2$); 7, seed ($\times 8$).



W. Smith del.
J. & P. Fitch lith.

West. Newman imp.

EPILOBIUM ROTUNDIFOLIUM, Forst.

PLATE 52.—EPILOBIUM ROTUNDIFOLIUM.

FAMILY ONAGRACEÆ.]

[GENUS EPILOBIUM, LINN.

Epilobium rotundifolium, Forst. Prodr. n. 161; Cheesem. Man. N.Z. Fl. 179.

As in the case of the preceding species, for the discovery of this plant we have to go back as far as the time of Cook's first voyage, when it was collected by Banks and Solander in Queen Charlotte Sound. Although fully described in Solander's manuscript "Primitiæ Floræ Novæ Zelandiæ" the species was never published by him; and Forster, who collected it in the same locality during Cook's second voyage, selected the name it still bears when describing it in his "Prodromus." His diagnosis, like all those given in the "Prodromus," is very short and insufficient; but a more complete description, taken from his manuscripts, appeared in A. Richard's excellent "Flore de la Nouvelle Zélande." Since then it has been observed by almost all those who have interested themselves with New Zealand plants, and is now known to be distributed in moist shaded localities throughout almost the whole of the Dominion, from the North Cape to Stewart Island, and from sea-level to nearly 3,000 ft. altitude.

E. rotundifolium is found in a great variety of situations. It is often seen creeping over bare ground in somewhat open forest, especially where the soil is naturally damp; it is common on moist shaded banks down which water trickles, and it is quite at home in mossy places by the side of waterfalls or on the shelving sides of streams. Of late years it has taken possession of the sides of many railway cuttings, where shaded from the sun and where the soil is sufficiently damp.

As a species *E. rotundifolium* is perhaps most closely allied to *E. limnæoides*. But it is larger, and has a more erect habit of growth; the upper leaves are alternate, and the inflorescence is terminal. In the "Handbook" Sir J. D. Hooker grouped it with the plants now known as *E. chloræfolium* and *E. insulare*, the specific distinctness of which is now generally recognized. The first can always be distinguished by the much more erect and firmer habit, and by the ovate or ovate-cordate nearly sessile leaves; while the latter has weaker and more elongated stems, with more distant sessile leaves, and the seeds are perfectly smooth. It has also been compared with *E. alsinoides*, but in reality there is little relationship between the two plants. *E. alsinoides* is much smaller, the leaves are smaller, paler, and more uniform in shape, the flowers are smaller and on longer peduncles, and the capsules are evenly covered with a close and fine pubescence.

PLATE 52. *Epilobium rotundifolium*, drawn from specimens collected near Mercer, in the Waikato district. Fig. 1, flower, with its subtending leaf or bract ($\times 3$); 2, flower ($\times 3$); 3, petal ($\times 6$); 4 and 5, front and back view of anthers ($\times 6$); 6, stigma ($\times 6$); 7, ripe capsule ($\times 2$); 8, seed (enlarged).



M. Smith del.
J. H. Fitch lith.

West, Newman imp.

EPILOBIUM BREVIPES, Hook. f.

PLATE 53.—EPILOBIUM BREVIPES.

FAMILY ONAGRACEÆ.]

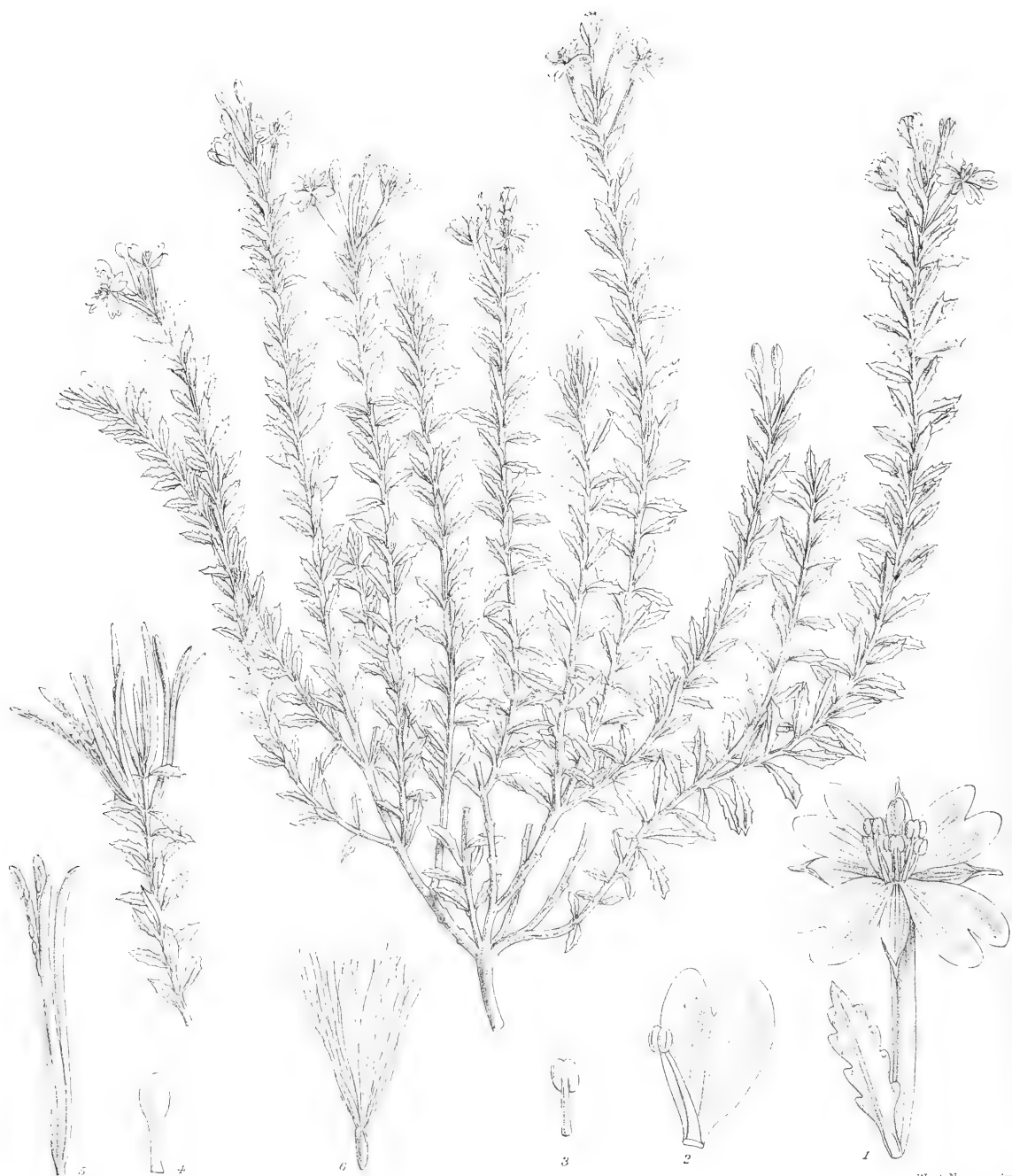
[GENUS EPILOBIUM, LINN.

Epilobium brevipes, Hook. f. *Fl. Nov. Zel.* ii. 328; *Cheesem. Man. N.Z. Fl.* 182.

Epilobium brevipes was originally collected in the Kaikoura Mountains by Mr. Macdonald, a shepherd in the employ of Sir David Monro. Although far from being a common plant, I have seen specimens from a considerable number of localities in Marlborough and North Canterbury, and consequently can hardly agree with the statement made by Mr. T. Kirk in his "Students' Flora," where he says that it is "of extreme rarity." Mr. Kirk himself has recorded it from the Upper Awatere; the Rev. F. R. Spencer has gathered it on Taylor's Pass; and Dr. Cockayne on Mount Fyffe. Mr. H. J. Matthews has sent me specimens from the Hammer district; Dr. Cockayne found it not uncommon in the gorge of the Conway River; while Mr. J. D. Enys, Mr. T. Kirk, and myself have all collected it on Mount Torlesse. Quite recently Dr. Cockayne has recorded its presence in the gorge of the Broken River. It is usually, if not invariably, found on the faces of limestone cliffs or precipices, and must be considered a purely rupestral species.

When once known *E. brevipes* cannot be easily confounded with any other species. The hard and woody base, the perfectly glabrous densely leafy stems, the coriaceous smooth and shining elliptic leaves, and the glabrous capsules, which are borne on very short peduncles which hardly elongate in fruit, are well-marked characters, the significance of which cannot be overlooked. Probably its nearest ally is *E. crassum*, which is a much smaller more creeping plant, with longer more obtuse leaves with the broadest part above the middle, larger flowers, and much longer peduncles. Coriaceous states of *E. glabellum* have been mistaken for it, but the two species differ so completely in habit, foliage, inflorescence, and fruit that if ordinary care is taken they ought never to be confused.

PLATE 53. *Epilobium brevipes*, drawn from specimens collected by Dr. Cockayne in the gorge of the Conway River, and by myself on Mount Torlesse. Fig. 1, tip of leaf (enlarged); 2 and 3, flowers ($\times 4$); 4 and 5, front and back view of anthers ($\times 6$); 6, stigma ($\times 6$); 7, ripe capsule ($\times 3$); 8, seed (enlarged).



M. Smith del.
J. N. Fitch lith.

West, Newman imp

EPILOBIUM MELANOCAULON, Hook.

PLATE 54.—EPILOBIUM MELANOCAULON.

FAMILY ONAGRACEÆ.]

[GENUS EPILOBIUM, LINN.

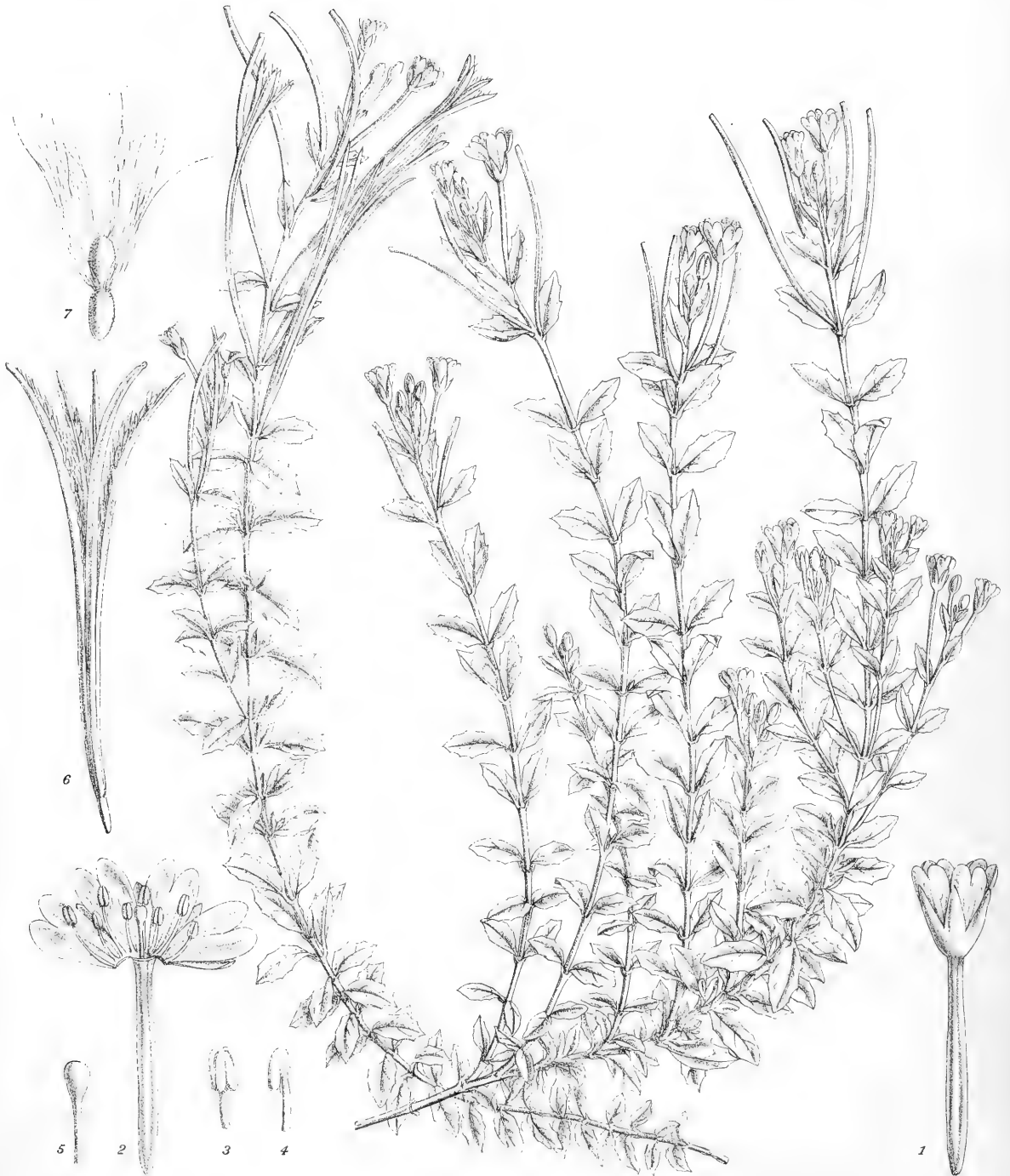
Epilobium melanocaulon, Hook. Ic. Plant. t. 813; Cheesem. Man. N.Z. Fl. 183.

Epilobium melanocaulon was discovered at about the same time by Mr. Colenso in the Ruahine Range and by Mr. Bidwill in the Nelson Provincial District. So far as the North Island is concerned, I have seen no specimens except those collected by Mr. Colenso; but in the South Island it has been found to be generally distributed in suitable localities from Nelson to Foveaux Strait. It is essentially one of those plants most abundant on the great stretches of shingle which fill the beds of many of the larger rivers which drain the Southern Alps. These banks of shingle may be covered in heavy floods, but ordinarily are quite bare, and support a very peculiar vegetation, such as several species of *Raoulia*, *Helichrysum depressum*, *Muhlenbeckia axillaris*, *Veronica Bidwillii*, and many others, among which the subject of this plate is always conspicuous.

In its typical state *E. melanocaulon* is perhaps as easily recognized as any species of the genus. Its erect sparingly branched rigid stems, springing in clumps from a hard and woody rootstock, and remarkable for their black or purplish-black colour, are most characteristic, as are the close-set and deeply-toothed leaves. The small flowers, and glabrous capsules on very short peduncles, are also excellent marks of the species. Its nearest ally is doubtless my *E. rostratum*, which has the same habit, but is much smaller, paler in colour, and covered with a uniform grey pubescence. The capsules are markedly different, being abruptly narrowed into a short beak at the tip. I do not know that it has any other close ally. In the "Handbook" Sir J. D. Hooker remarks that "states of it are difficult to separate from *E. confertifolium*, *glabellum*, and *brevipes*." But the first and last of these are really altogether different in habit, foliage, and inflorescence; and as for *E. glabellum*, it can generally be distinguished without difficulty by the much more developed inflorescence, which gives an entirely different aspect to the plant. The leaves are also much larger and broader, and not so deeply toothed.

In the Manual I have reduced Professor Haussknecht's *E. polyclonum* to the position of a variety of *E. melanocaulon*. It chiefly differs in the more slender branched stems, which are bifariously pubescent, and in the more distant less deeply toothed leaves; but these characters are barely sufficient to warrant its separation as a species.

PLATE 54. *Epilobium melanocaulon*, drawn from specimens collected on the shingle of the Cass River, Lake Tekapo. Fig. 1, flower, with its subtending leaf or bract ($\times 3$); 2, petal and stamen ($\times 5$); 3, back view of anther ($\times 5$); 4, stigma ($\times 5$); 5, ripe capsule ($\times 2$); 6, seed ($\times 8$).



M. Smith del
J.N. Fitch lith.

West, Newman imp.

EPILOBIUM GLABELLUM, Forst.

PLATE 55.—EPILOBIUM GLABELLUM.

FAMILY ONAGRACEÆ.]

[GENUS EPILOBIUM, LINN.

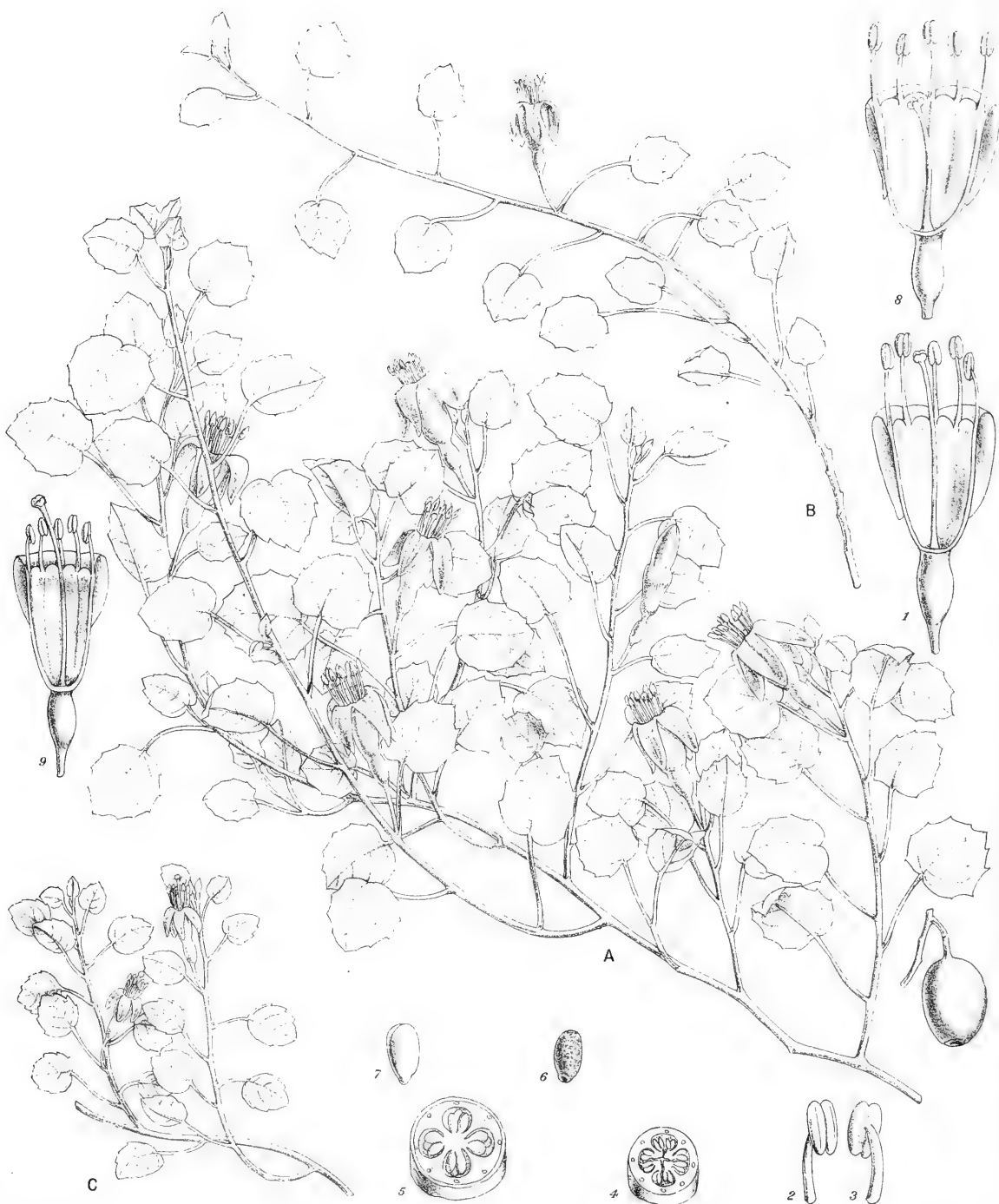
Epilobium glabellum, Forst. Prodr. n. 160 ; Cheesem. Man. N.Z. Fl. 185.

The subject of this plate was first gathered by Banks and Solander in Queen Charlotte Sound in 1769, and was again collected in the same locality by Forster during Cook's second voyage in 1773. Forster published the species in his "Prodrum" under the very appropriate name of *E. glabellum*, which appears to have been taken from Solander's manuscripts, but his diagnosis was much too short and scanty for a difficult genus like *Epilobium*; and succeeding writers have not always properly understood his plant. According to Professor Haussknecht, whose splendid monograph of the genus is usually followed by botanists, this was the case with Allan Cunningham and A. Richard, both authors mistaking a form of *E. junceum* for Forster's *glabellum*. The matter was still further complicated by the wide limits which Sir J. D. Hooker assigned to *E. glabellum*. He included in it, in part if not altogether, the Australian plants now distinguished as *E. sarmentaceum* and *E. erosum*, the South American *E. Lechleri* and *E. australe*, and in addition took in several New Zealand forms now considered to belong to other species. It is consequently by no means surprising that the species has been much misunderstood.

The characters which separate *E. glabellum* from the allied species are the numerous erect stems, which are either glabrous or provided with 2 or 4 faint pubescent lines decurrent from the petioles; the perfectly glabrous remotely sinuate-denticulate oblong or ovate-oblong leaves, which are often reddish or purple, and frequently shining; and by the lax terminal inflorescence, with moderately large flowers, the capsules being glabrous and borne on short peduncles which are seldom longer than the leaves. The average or typical state of the species, as characterized above, is a very common plant throughout the greater part of the Dominion, especially in mountain districts in the South Island, and can be recognized without the slightest difficulty. But, unfortunately, it runs into numerous varieties the systematic position of which is very difficult to define. One of the most conspicuous of these is the plant separated by Haussknecht as a distinct species under the name of *E. erubescens*. It has more rigid stems, with crowded and more erect leaves; the flowers are more numerous, and the capsules shorter and nearly sessile. It is certainly a well-marked variety, but is connected with the type by too many intermediate forms to be retained as a separate species.

I have not myself seen *E. glabellum* to the north of the Waikato River, and look upon it as decidedly rare northwards of the East Cape, although common enough further south. Haussknecht, however, states that he has examined specimens from the Bay of Islands, "between Waitangi and Kerikeri." It is somewhat remarkable that it has not yet been found in Stewart Island, especially as Dr. Cockayne has recorded the very closely allied *E. novæ-zelandiæ* from thence. It should perhaps be stated that *E. glabellum* is confined to New Zealand, the Australian and South American plants associated with it by Hooker and other writers being now regarded as distinct.

PLATE 55. *Epilobium glabellum*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 3,000 ft. Figs. 1 and 2, flowers ($\times 2$); 3 and 4, front and back view of anthers ($\times 4$); 5, stigma ($\times 4$); 6, ripe capsule ($\times 2$); 7, two seeds (enlarged).



M. Smith del.
J.N. Fitch lith

West, Newman imp.

FUCHSIA PROCUMBENS, R. Cunn.

PLATE 56.—FUCHSIA PROCUMBENS.

FAMILY ONAGRACEÆ.]

[GENUS FUCHSIA, LINN.

Fuchsia procumbens, R. Cunn. ex A. Cunn. Precur. n. 534; Cheesem. Man. N.Z. Fl. 187.

Quite apart from the interest which from the point of view of geographical distribution must always attach to the presence in New Zealand of three species of the otherwise purely South American genus *Fuchsia*, there are certain biological facts concerning the New Zealand species which deserve more searching examination than has yet been given to them. I allude to the curious heterostyled flowers which all the species produce. Mr. T. Kirk, who was the first to investigate the matter with any detail, showed that in *F. excorticata* and *F. Colensoi* there are three forms of flower, each with a style of different length, which can be distinguished as the long-styled, the mid-styled, and the short-styled forms; and that these differences in the length of the styles are correlated with differences in the length of the stamens, the long-styled form having the shortest stamens, and the short-styled form having the longest. The remaining species, *F. procumbens*, the subject of this plate, possesses the three kinds of flower differing in the length of the style, but the stamens are the same length in each case.

The discoverer of *F. procumbens* was Richard Cunningham, who in 1834 collected it at Matauri Bay, a little indentation on the coast-line between Whangaroa and the Bay of Islands, and situated almost directly opposite the Cavallos Islands. It was first described by his brother, Allan Cunningham, in the well-known "Precursor," and a few years later was figured by Sir W. J. Hooker in the "Icones Plantarum" (t. 421) from specimens collected in the same locality by Mr. Colenso. From an examination of this plate, and from Cunningham's description, it is evident that the plant was the one now recognized as the long-styled form, the large globose stigma being far-exserted beyond the flower. For many years no further information was obtained, and no one supposed that other forms of the species existed. In December, 1867, however, Mr. T. Kirk gathered a *Fuchsia* in Tryphena Harbour, Great Barrier Island, that differed from Cunningham's plant in the shorter broader flowers, and especially in the short style, which was entirely included in the flower, the stigma being much below the level of the anthers. These differences were so noticeable that Sir J. D. Hooker treated the plant as a distinct species, and figured it in the "Icones Plantarum" (t. 1084) under the name of *Fuchsia Kirkii*. But he also acknowledged that in habit and foliage the two plants were identical, and that at first he was inclined to regard the differences as sexual. A few years later another form of the species found its way into cultivation, in which the style was of intermediate length, the stigma being on the same level as the anthers. This discovery proved that *F. procumbens* agreed with *F. excorticata* in possessing three distinct forms of flower, but differed (as has been stated above) in the stamens being of the same length in each form.

Since the publication of Mr. Kirk's paper on "Heterostyled Trimorphic Flowers in the New Zealand Fuchsias" (Trans. N.Z. Inst. xxv (1893), 261) much information has been obtained respecting *F. procumbens*, and some of his conclusions require modification. In the first place, the species is not nearly so rare as he supposed, as will be seen from the following list of localities: Cabbage Bay, J. Adams! (short-styled form); Tryphena Harbour and Mine Bay, Great Barrier Island, T. Kirk! A. J. Osborne! L. T. Griffin! (short-styled form); Whangarei Heads and coast near Ngunguru, T. F. C. (short-styled form); Whangaruru Harbour, T. Kirk (short-styled form); Matauri Bay, R. Cunningham

(long-styled form); Kawerua, Hokianga, Dr. Cockayne (form not stated); Ahipara, T. F. C. (long-styled form); Waihi, fifteen miles north of Ahipara, T. F. C. (mid-styled and short-styled forms); coast near Houhora and near Cape Maria, T. F. C. (form not recorded); between the North Cape and Parengarenga, abundant, T. F. C. (mid-styled and short-styled forms). From the above it will be noticed that Mr. Kirk's belief that the different forms never grow intermixed is not correct. At Ahipara all three forms occur within fifteen miles of one another, if not nearer; and two of them grow side by side at Waihi. At the same time, it is most remarkable that one form alone—the short-styled—has yet been found to the south of the Bay of Islands.

Mr. Kirk also states that fruit is seldom seen on the mid-styled and short-styled form in cultivation, and never in the wild state. But I have cultivated the mid-styled form (and no other) in my garden for more than twenty years, and every year fruit has been produced in comparative abundance. I have seen as many as forty ripe berries at one time on a single plant. And I understand that the experience of other cultivators has been the same. It is therefore clear that, so far as the mid-styled form is concerned, it is not necessary for the production of fruit that the flowers should be fertilized by pollen from one of the other forms. I much regret that neither of the two other forms has been in cultivation in Auckland for some years past, and that consequently I am unable to say whether they also ripen their fruit in gardens. As regards the production of fruit in the wild state, all my visits to the localities where the plant exists have been too early in the season for me to obtain it. But Mr. A. J. Osborne informs me that the short-styled form ripens fruit freely at Tryphena Harbour, and I am assured that fruit is regularly observed on all the forms in the North Cape district.

It is much to be desired that some horticulturist would cultivate the three forms of *F. procumbens* and ascertain what results would follow if they were intercrossed. It must be admitted that the fact that the mid-styled form is fertile with its own pollen, and that the stamens are of the same length in all the forms, is opposed to the idea that the case is one of pure heterostylism as usually understood. We require to know if there are differences in the pollen of the three forms; if some of the unions are fertile and others infertile—in short, whether the forms are specially adapted for reciprocal fertilization. Until such proof is obtained it is perhaps reasonable to suppose that the long-styled form, with its larger stigma and somewhat smaller anthers, is simply a variety advancing in the direction of becoming a female plant; while the short-styled variety, with its smaller stigma and more abundant pollen, is in a similar way tending in the direction of becoming purely male.

PLATE 56. *Fuchsia procumbens*. A, mid-styled form, drawn from specimens cultivated at Auckland; B, short-styled form, from specimens collected at Tryphena Harbour, Great Barrier Island, by Mr. A. J. Osborne; C, from specimens gathered in Ahipara Bay, North Cape district. Fig. 1, section of flower (mid-styled form); 2 and 3, front and back view of anthers from same; 4, section of ovary; 5, section of ripe fruit; 6, seed; 7, embryo; 8, section of short-styled form; 9, section of long-styled form (the stigma is usually larger and further exerted than represented by the artist). (All the figures enlarged.)



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

TETRAGONIA TRIGYNA, *Banks & Sol.*

PLATE 57.—TETRAGONIA TRIGYNA.

FAMILY FICOIDEÆ.]

[GENUS TETRAGONIA, LINN.

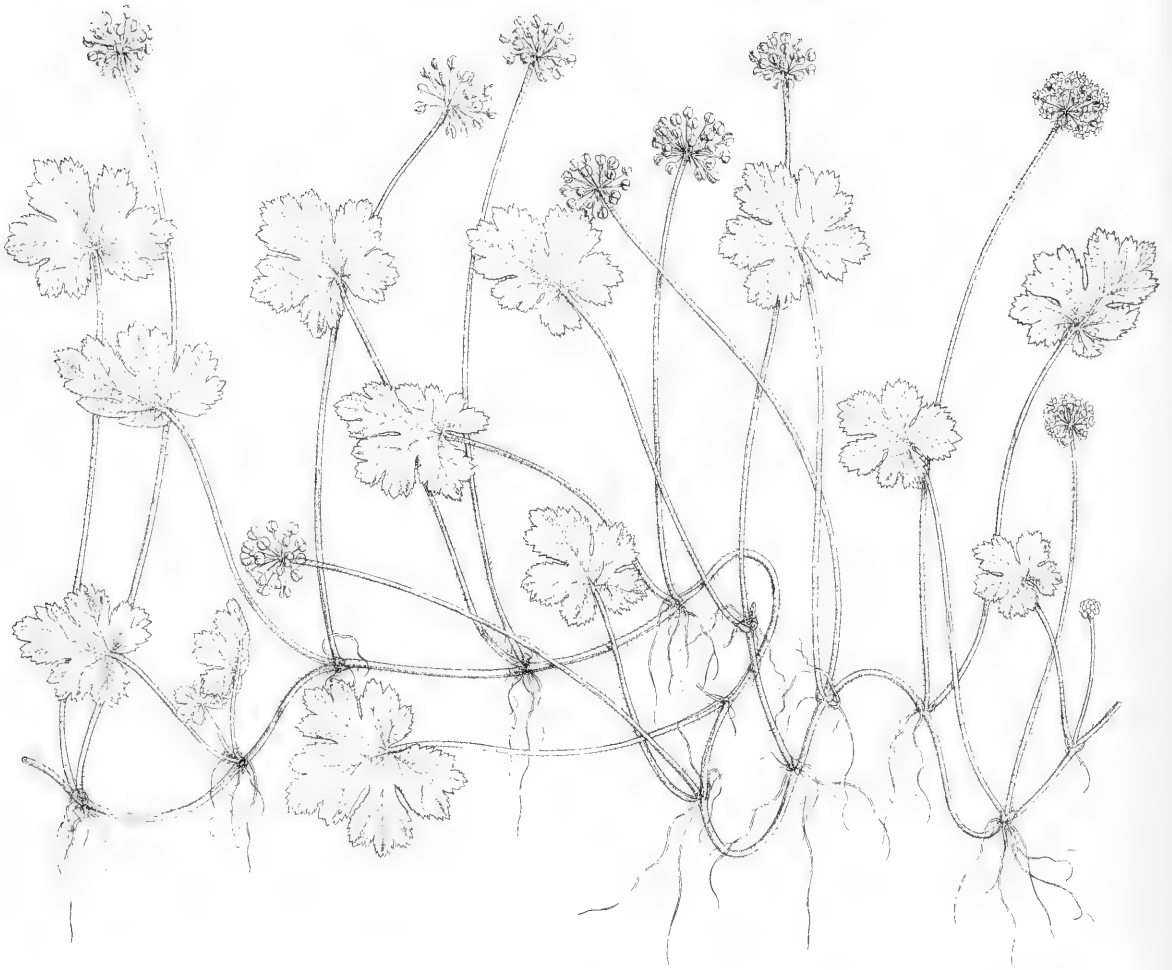
Tetragonia trigyna, Banks & Sol. ex Hook. f. *Fl. Nov. Zel.* i. 77; *Cheesem. Man. N.Z.* Fl. 192.

Tetragonia trigyna was first discovered by Banks and Solander in Queen Charlotte Sound in 1769. It was not only excellently described by Solander in his manuscript "Primitiæ Floræ Novæ Zelandiæ" under the name it now bears, but a faithful drawing was also prepared for the unpublished Banksian plates, making it quite easy to be sure of the identity of Solander's plant. Unfortunately, succeeding explorers confused it with the closely allied *T. expansa*, an easy thing to do when working on dried specimens, which in a genus possessing the thick and fleshy habit of *Tetragonia* lose many characters which are obvious enough in a fresh state. Thus neither A. Richard, A. Cunningham, nor Raoul mention more than one *Tetragonia* as found in New Zealand. Sir J. D. Hooker, in his "Flora Novæ Zelandiæ," also places both species under *T. expansa*, but he quotes Solander's name of *T. trigyna* as well, this being the first occasion that it was actually published. About this time specimens and information respecting the species were forwarded to Kew by Dr. Sinclair and Mr. Colenso, and it was definitely published by Sir J. D. Hooker in the "Handbook" in 1864.

The range of *T. trigyna* within the Dominion is now fairly well ascertained. It occurs in rocky or sandy places on many parts of the coast-line, from the Kermadec Islands and the North Cape to Stewart Island, and is also found on the Chatham Islands. Although common in many localities it is comparatively rare in others, and notwithstanding its wide distribution is by no means generally spread. Comparing it with *T. expansa*, it is quite obvious that no one familiar with the two plants in a living state would ever confuse them. *T. trigyna* differs markedly in its trailing or almost climbing habit, in its smaller and broader more obtuse leaves, and particularly in the globose bright-red succulent fruit, which is not at all horned, which is always the case in *T. expansa*.

It is doubtful whether *T. trigyna* is not identical with the Australian *T. implexicoma*, Miq.; and, if so, Miquel's name will take precedence. It was published in 1844; whereas *T. trigyna* cannot possibly date earlier than the publication of the "Flora Novæ Zelandiæ" in 1853; Solander's manuscript "Primitiæ," unfortunately, not counting as "effective publication." According to descriptions, however, the Australian plant has longer and more acute leaves, and longer peduncles. Until a careful comparison can be made it is better to treat the two plants as distinct.

PLATE 57. *Tetragonia trigyna*, drawn from specimens collected on the Little Barrier Island and Cuvier Island. Figs. 1 and 2, flowers; 3, calyx laid open; 4 and 5, front and back view of anthers; 6, longitudinal section of ovary; 7, transverse section of ovary; 8, fruit; 9, section of fruit; 10, seed; 11, embryo. (All enlarged.)



M. Smith del.
J.N. Pritch lith.

West, Newman imp.

HYDROCOTYLE ELONGATA, A. Cunn.

PLATE 58.—HYDROCOTYLE ELONGATA.

FAMILY UMBELLIFERÆ.]

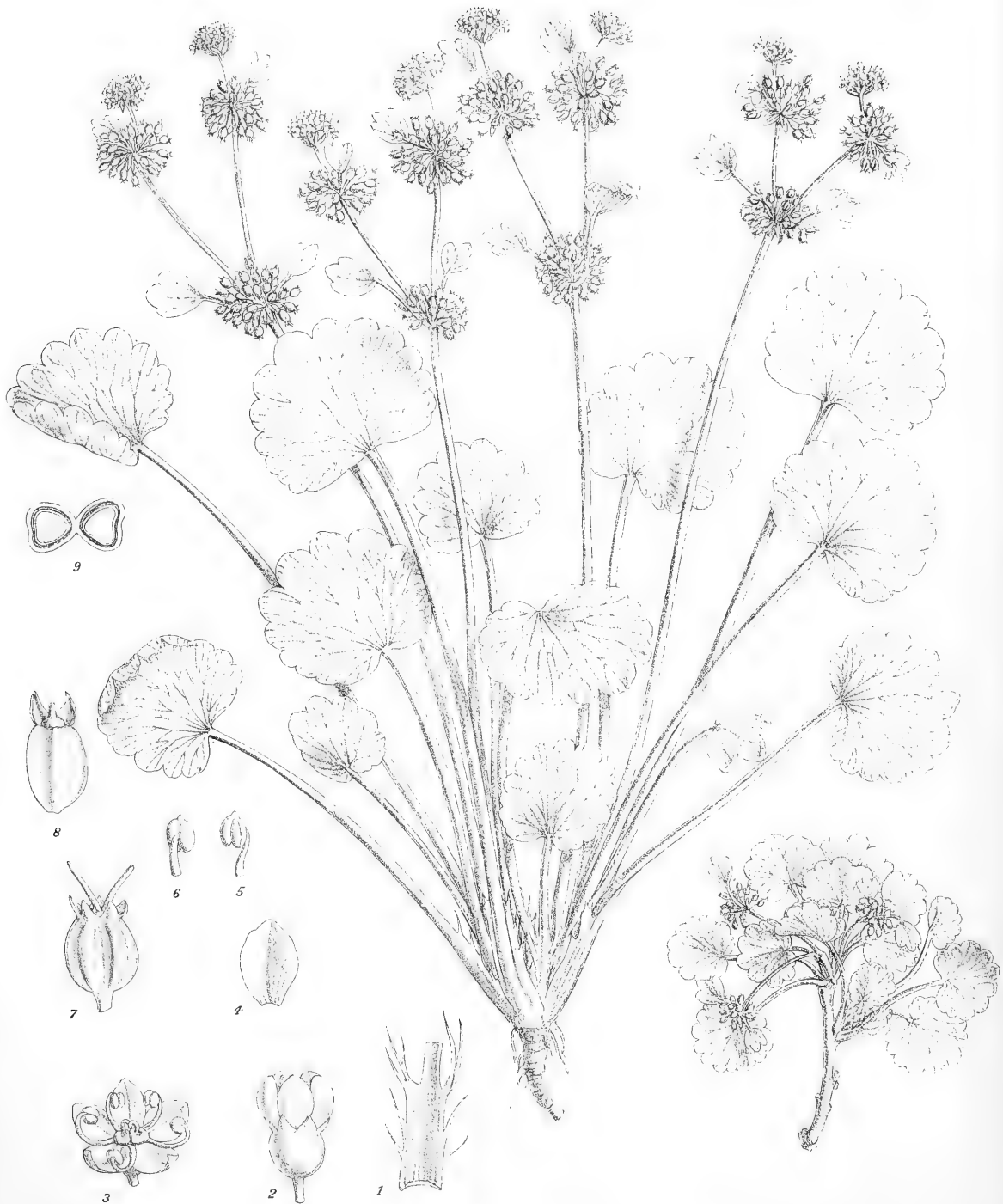
GENUS HYDROCOTYLE, LINN.

Hydrocotyle elongata, A. Cunn. *Precur.* n. 495; *Cheesem. Man. N.Z. Fl.* 195.

The cosmopolitan genus *Hydrocotyle* is well represented in New Zealand, nine or possibly ten species being found therein. Of these, by far the finest is the subject of this plate, which was first discovered by Richard Cunningham in the year 1834 near the well-known Kerikeri Falls, in the Bay of Islands district: the favourite botanizing-ground of the Cunninghams, Colenso, Hooker, and others. Subsequent collectors have found it to be fairly plentiful in moist shaded localities from the North Cape to the south of Otago. It is mainly a lowland plant, and I have no notes of its occurrence at a greater altitude than about 2,000 ft.

H. elongata is not closely allied to any other of the New Zealand species. Its distinguishing characters are the large size, softly pilose habit, deeply lobed leaves, long peduncles, and very conspicuous slender pedicels to the flowers. In some points of habit and appearance *H. dissecta* approaches it, but is easily separated by the smaller size, more deeply lobed leaves, many-flowered umbels, and the sessile flowers. *H. americana*, *H. pterocarpa*, and *H. novæ-zelandiæ* have shallow lobes to the leaves, which are almost glabrous, and the flowers are nearly sessile in the umbels. I am not acquainted with any foreign species which can be considered closely allied.

PLATE 58. *Hydrocotyle elongata*, drawn from specimens collected in the Whangarei district. Figs. 1 and 2, flowers ($\times 8$); 3 and 4, front and back view of anthers ($\times 8$); 5, ovary ($\times 8$); 6, ripe fruit ($\times 5$); 7, a single mericarp, seen from the commissure ($\times 5$); 8, section of fruit ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

AZORELLA HAASTII, Benth & Hook f.

PLATE 59.—AZORELLA HAASTII.

FAMILY UMBELLIFERÆ.]

[GENUS AZORELLA, LAM.

Azorella Haastii, Benth. & Hook. f. ex T. Kirk, *Students' Fl.* 192: *Cheesem. Man. N.Z.*
Fl. 201.

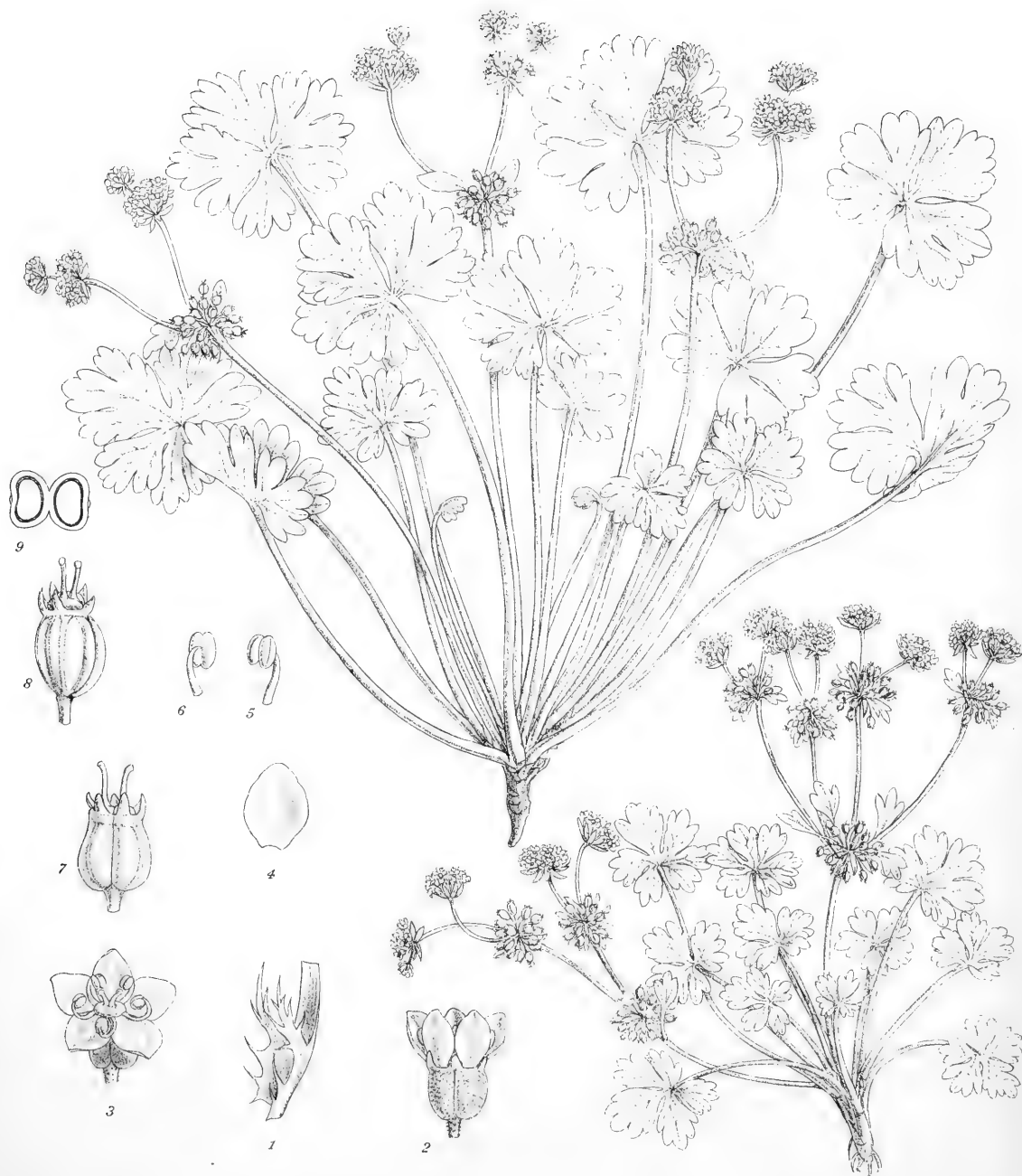
For the first discovery of this fine plant we are indebted to Sir Julius von Haast, who in May, 1862, collected it in the upper part of the Hopkins River, which, after uniting with the Dobson, flows into the head of Lake Ohau. Later on he gathered it in the valley of the Hunter, above Lake Hawea, and subsequently in several localities in the central chain of the Southern Alps. In 1864 Sir J. D. Hooker published it in the first part of the "Handbook of the New Zealand Flora," very appropriately using the name of its enthusiastic discoverer, who in the years between 1860 and 1870 did more for the botanical exploration of the mountains of the South Island than any other person. Since that period it has been proved to be fairly plentiful in most of the mountain districts of the South Island, from Nelson to Otago. Its altitudinal range is from 2,000 ft. to 5,000 ft. There are specimens in Mr. Kirk's herbarium collected on the Ruahine Range by Mr. A. Hamilton, but I have seen no other examples from the North Island.

The nearest ally of *A. Haastii* is undoubtedly the Auckland Island *A. reniformis*, which in fact only differs in its smaller size, entire stipules, few-flowered umbels, and fruit always longer than its pedicel. But reduced states of *A. Haastii* come very near to *A. reniformis*, and in fact have been mistaken for it both by myself and the late Mr. Kirk (see "Students' Flora," p. 192). I cannot doubt that both plants are recent offshoots from a common parent.

The New Zealand species of *Azorella* were originally placed in the genus *Pozoa* by Sir J. D. Hooker. In the "Genera Plantarum" *Pozoa* was merged with *Azorella*; but the New Zealand species (with the exception of *A. Selago*, which is a typical *Azorella*) were placed in Hooker's subgenus *Schizeilema*, which was originally proposed in the "Flora Antarctica" for *A. reniformis*. In a recent number of Engler's "Botanische Jahrbucher" (vol. xl, p. 573) Dr. Karl Domin proposes to constitute a separate genus of *Schizeilema*, pointing out that it is not only separated by a marked difference in habit, but by other characters of importance. He would include in it not only the New Zealand forms, but also two species from the extreme south of South America, and the Australian *Azorella Muelleri*, Benth. (*Schizeilema fragosum*, Domin). There is much to be said in favour of Domin's views; and if the present plate had not been already struck off when his memoir reached New Zealand I should have adopted his name of *Schizeilema Haastii*.

It may be stated that in Domin's memoir a variety of *A. Haastii* is stated to possess "blue petals." This I believe to be incorrect so far as the fresh state is concerned, but I have frequently noticed the petals to take on a blueish tinge after drying.

PLATE 59. *Azorella Haastii*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 3,000 ft. Fig. 1, sheathing-base of petiole, showing the ciliate margins (enlarged); 2 and 3, flowers ($\times 8$); 4, a single petal ($\times 10$); 5 and 6, front and back view of anthers ($\times 10$); 7, fruit ($\times 6$); 8, a single mericarp of the fruit ($\times 6$); 9, section of fruit ($\times 6$).



M. Smith del.
J.N. Fitch lith.

AZORELLA ROUGHII, Benth & Hook f.

West, Newman imp.

PLATE 60.—AZORELLA ROUGHII.

FAMILY UMBELLIFERÆ.]

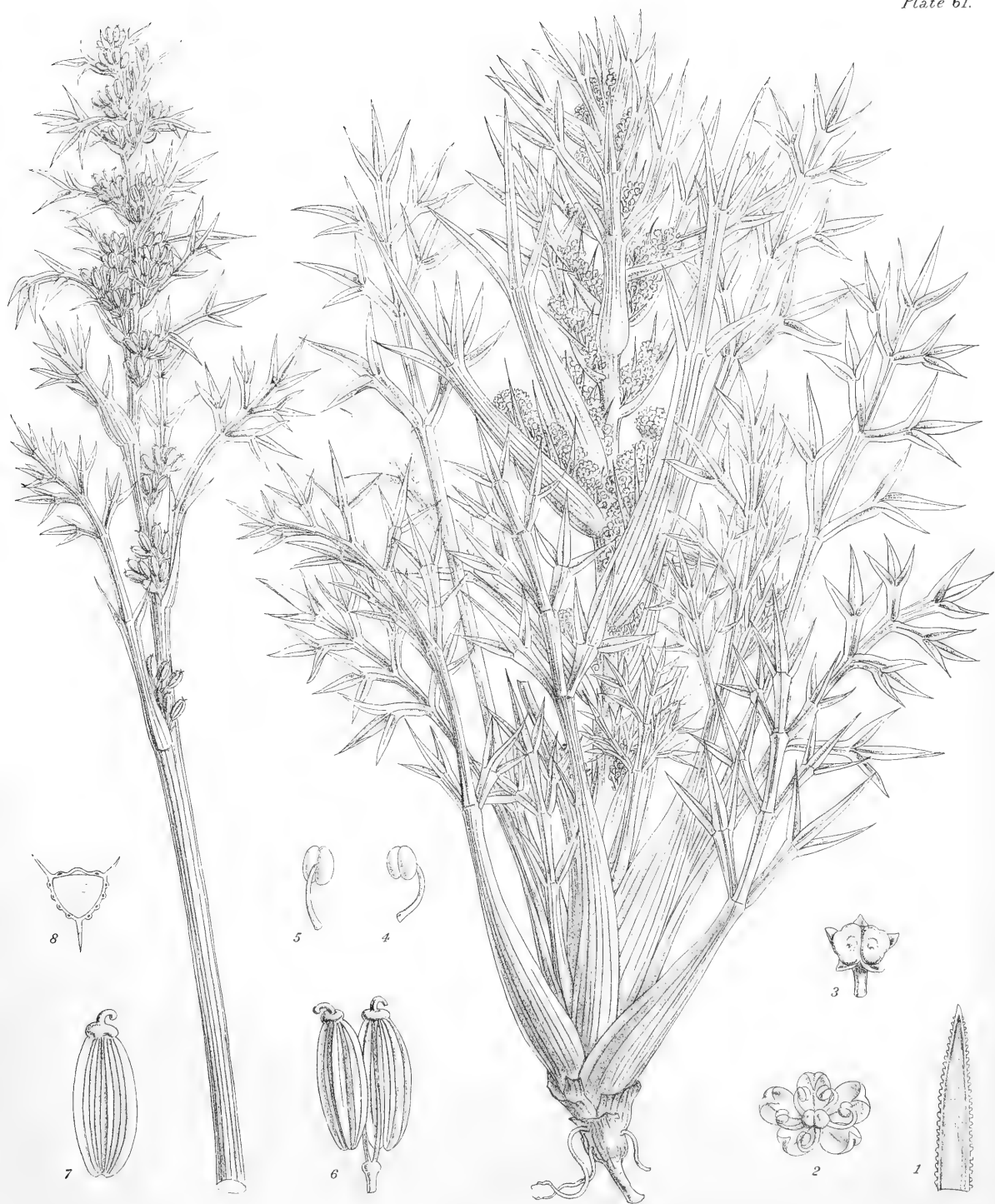
[GENUS AZORELLA, LAM.

Azorella Roughii, Benth. & Hook. f. ex T. Kirk, *Students' Fl.* 192; *Cheesem. Man. N.Z. Fl.* 201.

Azorella Roughii was one of the discoveries of Captain D. Rough, who between the years 1858 and 1862 gave a considerable amount of attention to the mountain-flora of the Nelson Provincial District. His specimens were obtained on Dun Mountain, near Nelson—an excellent collecting-ground, and one on which many interesting plants were noticed for the first time, as, for instance, *Stellaria Roughii*, *Lobelia Roughii*, *Myosotis Monroi*, *Pimelea Suteri*, &c. In 1862 the species were published in the "Handbook" by Sir J. D. Hooker under the name it now bears. Its range is much more limited than that of *A. Haastii*, and so far I have not seen specimens from the south of the Spenser Mountains. It is abundant in many parts of the Dun Mountain Range, extending southwards along the Raglan Mountains to the Wairau Gorge, where I collected it many years ago. Still further south it has been gathered by Mr. T. Kirk and myself on several of the mountains flanking the Waiau and Clarence Valleys. Its north-eastern limit appears to be on Mount Stokes, from whence I have seen specimens obtained by Mr. Macmahon. Mr. Gibbs and myself have gathered it on Mount Arthur and other peaks in north-western Nelson; and I have seen specimens collected by Mr. Townson in some locality near Westport, although it is not mentioned in his list of Westport plants printed in the "Transactions of the New Zealand Institute" (vol. xxxix, p. 380).

As a species *A. Roughii* comes very close to *A. Haastii*, of which it has the size, habit, and inflorescence. But it can always be readily separated by the 3-5-foliate or -partite leaves. *A. pallida* is also allied, but is much smaller and more slender, and the leaves are much more membranous.

PLATE 60. *Azorella Roughii*, drawn from specimens collected by Mr. F. G. Gibbs on Ben Nevis, at an altitude of 4,500 ft., and by myself on Mount Arthur. Fig. 1, sheathing-base of petiole, showing the stipuliform margins; 2 and 3, flowers ($\times 8$); 4, petal ($\times 10$); 5 and 6, front and back view of anthers ($\times 10$); 7 and 8, fruit ($\times 6$); 9, section of fruit ($\times 6$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

ACIPHYLLA HOOKERI, *T. Kirk.*

PLATE 61.—ACIPHYLLA HOOKERI.

FAMILY UMBELLIFERÆ.]

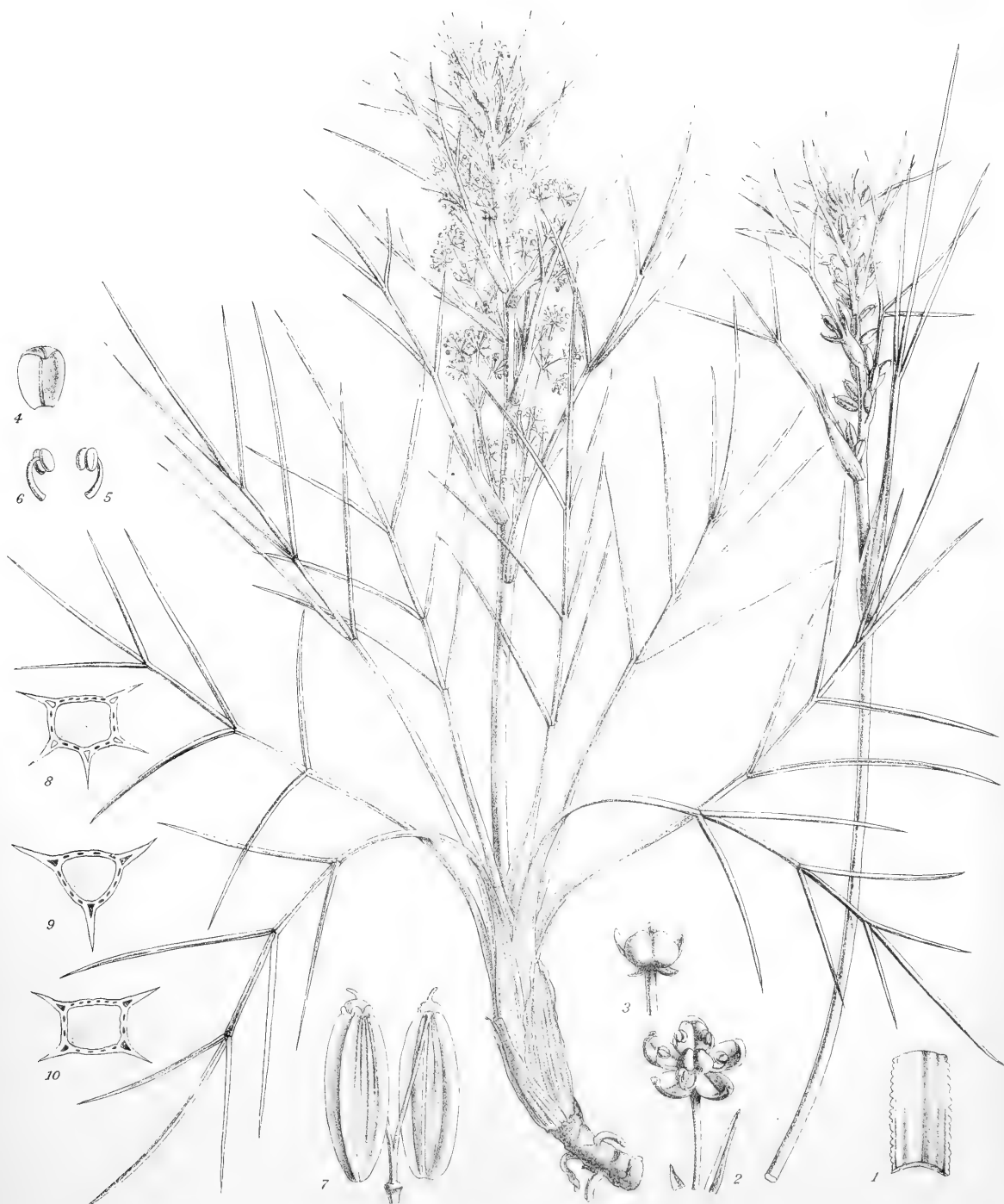
[GENUS ACIPHYLLA, FORST.

Aciphylla Hookeri, T. Kirk. *Students' Fl.* 209; *Cheesem. Man. N.Z. Fl.* 210.

The subject of this plate is one of the most remarkable species of a very remarkable genus. It was first discovered by Mr. J. Dall, well known for his botanical explorations in the Collingwood district, in the high mountainous country near the source of the Heaphy River, which, rising on the western side of the watershed behind Collingwood, flows in a south-westerly direction until it enters the sea no great distance to the north of Karamea. In all probability it extends southwards on the summits of the coastal ranges; for Mr. Townson, when investigating the vegetation of the vicinity of Westport, found it to be not uncommon on the Brunner and Paparoa Mountains, at an elevation of from 2,500 ft. to 4,000 ft. It is specially plentiful on Mount Faraday and Mount Buckland, from whence Mr. Townson obtained the specimens used in the preparation of this plate.

A. Hookeri is a very distinct species, quite unlike any other. It can be recognized at a glance by the short flat squarrose ultimate segments of the leaf, which are flat or concave above, but keeled beneath, and which give the tips of the leaves a curious trifid appearance quite foreign to the rest of the genus. Probably its nearest relative is *A. Lyallii*; but that species has much longer and narrower leaf-segments, which are never squarrose, as in *A. Hookeri*. In addition to that, the whole aspect of the two plants is different. *A. Hookeri* should therefore be regarded as an unusually isolated form of the genus, restricted to a limited district in the north-west portion of the South Island. Its geographical area almost exactly corresponds with that of *Drimys Traversii*, *Metrosideros Parkinsoni*, and *Gentiana Spenceri*, three equally distinct and remarkable plants.

PLATE 61. *Aciphylla Hookeri*, drawn from specimens collected on Mount Buckland, near Westport, at an altitude of 4,000 ft. Fig. 1, tip of leaflet (enlarged); 2, flower ($\times 8$); 3, the same with the petals removed ($\times 10$); 4 and 5, front and back view of anthers ($\times 10$); 6, fruit ($\times 5$); 7, single carpel ($\times 5$); 8, transverse section of carpel ($\times 5$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

ACIPHYLLA TOWNSONI, *Cheesem.*

PLATE 62.—ACIPHYLLA TOWNSONI.

FAMILY UMBELLIFERÆ.]

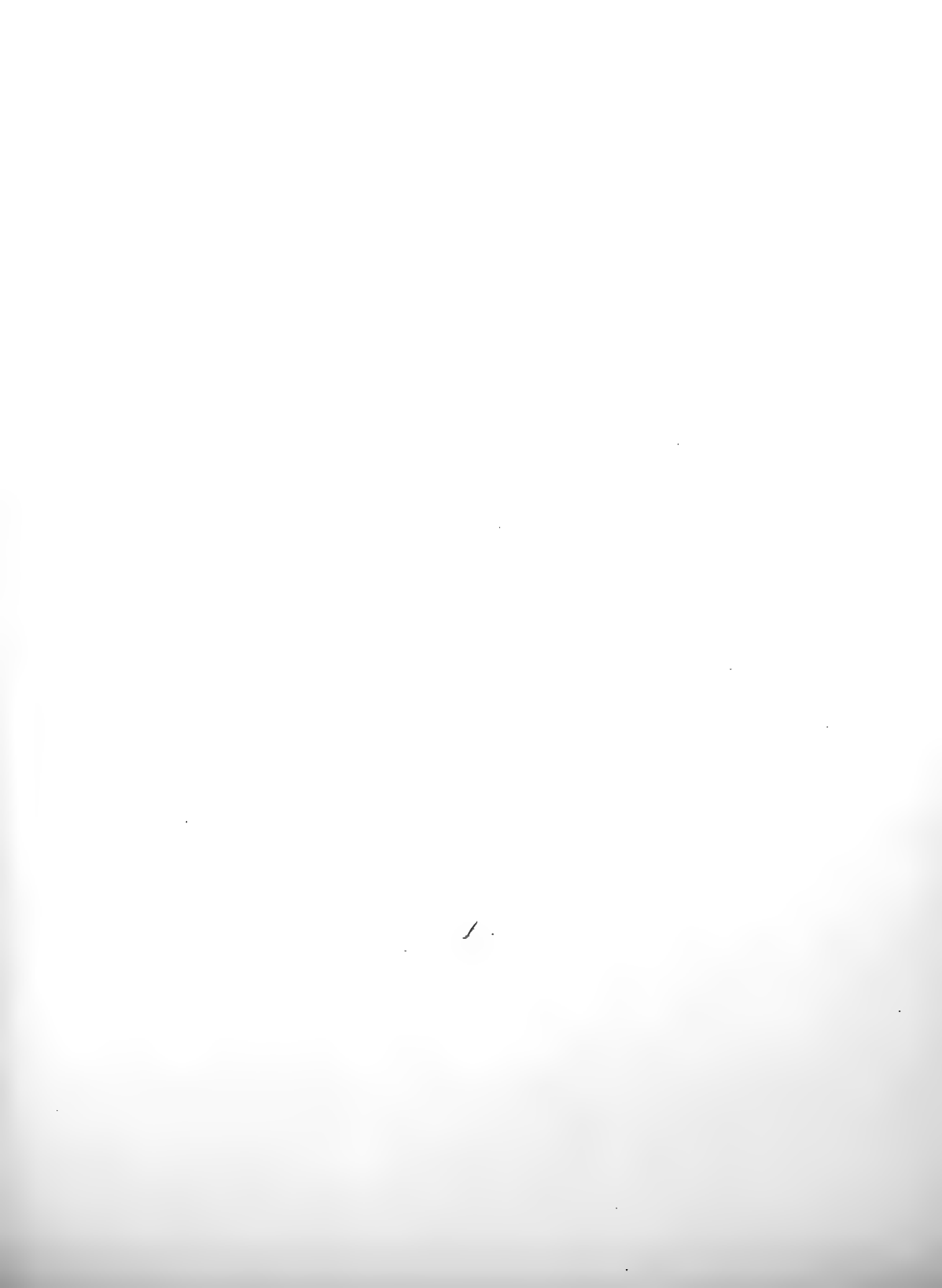
[GENUS ACIPHYLLA, FORST.

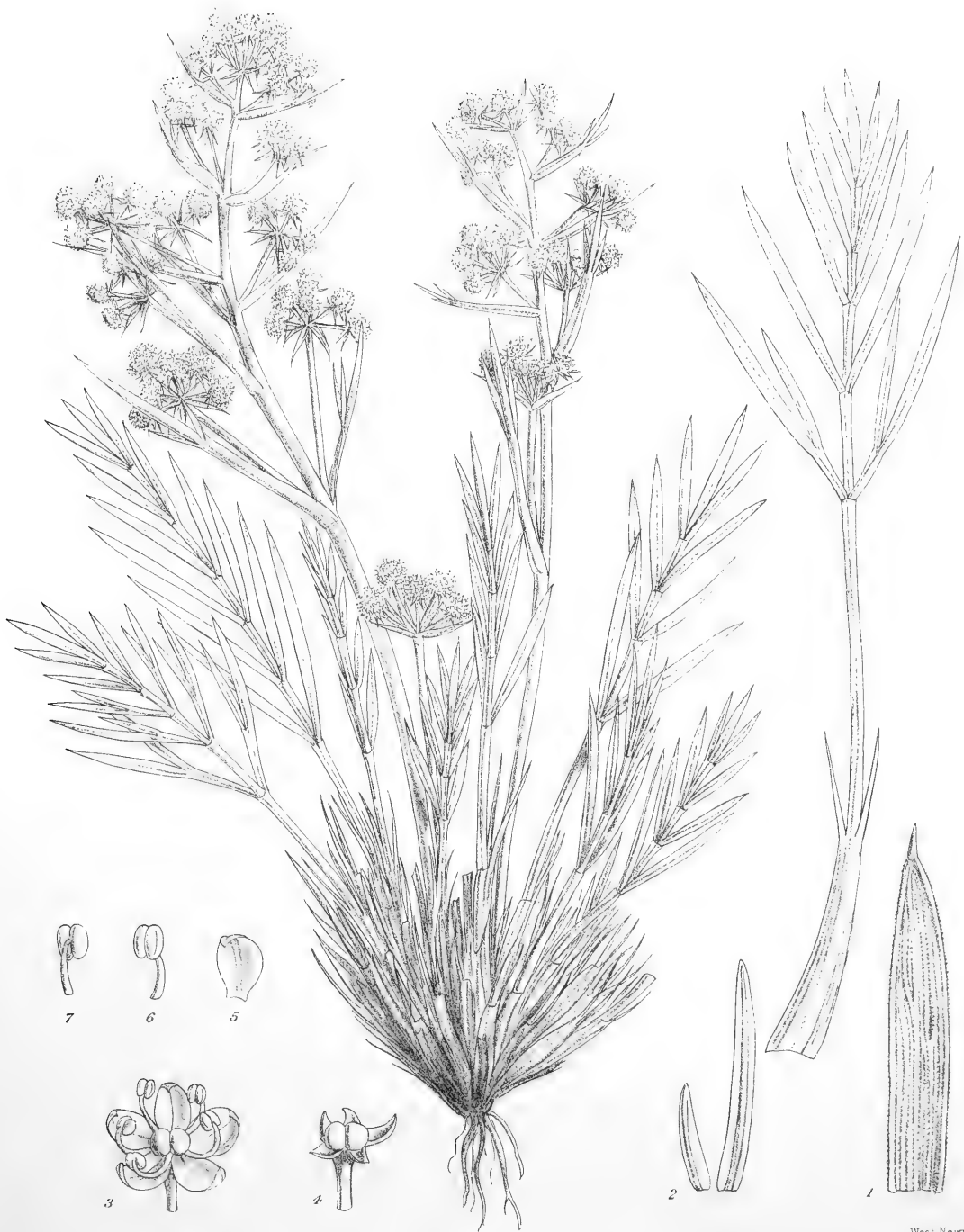
Aciphylla Townsoni, *Cheesem. Man. N.Z. Fl.* 1138.

This is a comparatively recent addition to the New Zealand flora, having been first gathered by Mr. Townson, in the autumn of 1901, on Mount Buckland, the northern termination of the Paparoa Range, and situated only a short distance to the south of the mouth of the Buller River. Since then Mr. Townson has collected it on Mount Kelvin, Mount Faraday, and some others of the peaks of the Paparoa Range, usually between the altitudes of 3,000 ft. and 4,500 ft. He has also met with it on the Lyell Mountains, to the north of the Buller Valley; but, curiously enough, has never been able to find it on Mount Rochfort and the other coastal peaks immediately to the north. The species was published by myself in the Appendix to the Manual, and I had much pleasure in associating Mr. Townson's name with it. For many years he had diligently investigated the vegetation of the Westport district, making numerous interesting discoveries, and obtaining much novel information respecting the geographical range of the species.

As a species *A. Townsoni* falls naturally into the neighbourhood of *A. Lyallii*, and is not very far removed from the variety *crenulata* of that species. But it is amply distinct in the much more slender and more flaccid habit, and in the extremely narrow leaf-segments, which do not exceed $\frac{1}{10}$ in. in diameter, and in some forms are even narrower. No other species of *Aciphylla*, in fact, has such narrow leaves. The flowers and fruit appear to be of the same type as *A. Lyallii*.

PLATE 62. *Aciphylla Townsoni*, drawn from specimens collected on Mount Buckland, near Westport, at an altitude of 4,000 ft. Fig. 1, portion of leaf (enlarged); 2, male flower, with bracts ($\times 10$); 3, flower, with petals and stamens removed ($\times 12$); 4, petal ($\times 10$); 5 and 6, front and back view of anthers ($\times 12$); 7, fruit ($\times 8$); 8, 9, and 10, sections of fruit, showing variation in the number of the ribs ($\times 8$).





M. Smith del.
J.N. Fitch lch.

West, Newman 2202

ACIPHYLLA MUNROI, Hook. f.

PLATE 63.—ACIPHYLLA MONROI.

FAMILY UMBELLIFERÆ.]

[GENUS ACIPHYLLA, FORST.

Aciphylla Monroi, Hook. f. *Fl. Nov. Zel.* ii, 330; *Cheesem. Man. N.Z. Fl.* 212.

One of the earliest explorers of the vegetation of the north-eastern portions of the South Island was Sir David Monro, who for many years occupied a prominent position in the parliamentary life of the colony, ultimately holding the position of Speaker of the House of Representatives. How much he did for botany in New Zealand can be roughly estimated from the following list of prominent species dedicated to him by Sir J. D. Hooker or other botanists: *Ranunculus Monroi*, *Carmichaelia Monroi*, *Aciphylla Monroi*, *Celmisia Monroi*, *Raoulia Monroi*, *Senecio Monroi*, *Myosotis Monroi*, and *Euphrasia Monroi*. And these names represent only a small portion of the species which he added to the flora of his adopted country at various times between the years 1859 and 1870.

Aciphylla Monroi, the species figured on this plate, was discovered in the year 1853 on the "summit of Macrae's Run, alt. 4,500 ft." I am not quite certain of the exact position of this locality, but believe it to be in the Awatere Valley, in which a tract of pastoral land was held by a Mr. Macrae, many portions of which are known to have been frequently botanized over by Monro. The species was first published in a list of addenda printed at the close of the second volume of the "*Flora Novæ Zelandiæ*." In the "*Handbook*" Sir J. D. Hooker gives several additional localities for the plant, and many others have been recorded by subsequent observers. But I have long considered it highly doubtful whether the whole of these habitats have been correctly assigned to *A. Monroi*; and Mr. W. B. Hemsley, who has kindly examined the whole of the specimens referred to the species in the Kew Herbarium, is of the same opinion. Under these circumstances, I have decided to figure Monro's original specimens, preserved at Kew, so that workers in the Dominion may, at any rate, be sure of the type of the species.

From the above it will be readily understood that it is difficult to indicate the precise range of *A. Monroi*, several of the recorded localities being referable to forms which in my opinion should be excluded from the species, while in other cases I have had no opportunity of examining specimens. It appears to be most plentiful on the mountains of Marlborough and Nelson, but I have seen examples in several stations in Canterbury, and have reason to believe that it also occurs in Otago.

PLATE 63. *Aciphylla Monroi*, drawn from specimens collected on "Macrae's Run" by Sir David Monro. Fig. 1, tip of leaflet; 2, bracts; 3, flower; 4, the same with the petals removed; 5, petal; 6 and 7, front and back view of anthers. (All enlarged.)



M. Smith del
J.N. Fitch lith.

West, Newman imp.

COXELLA DIEFFENBACHII, Cheesem & Hemsl.

PLATE 64.—COXELLA DIEFFENBACHII.

FAMILY UMBELLIFERÆ.]

[GENUS COXELLA. CHEESEM.

Coxella Dieffenbachii, *Cheesem. in Trans. N.Z. Inst.* xlv (1912). 160.

Ligusticum Dieffenbachii, *Hook. f. Handb. N.Z. Fl.* 729.

Aciphylla Dieffenbachii, *T. Kirk, Students' Fl.* 211.

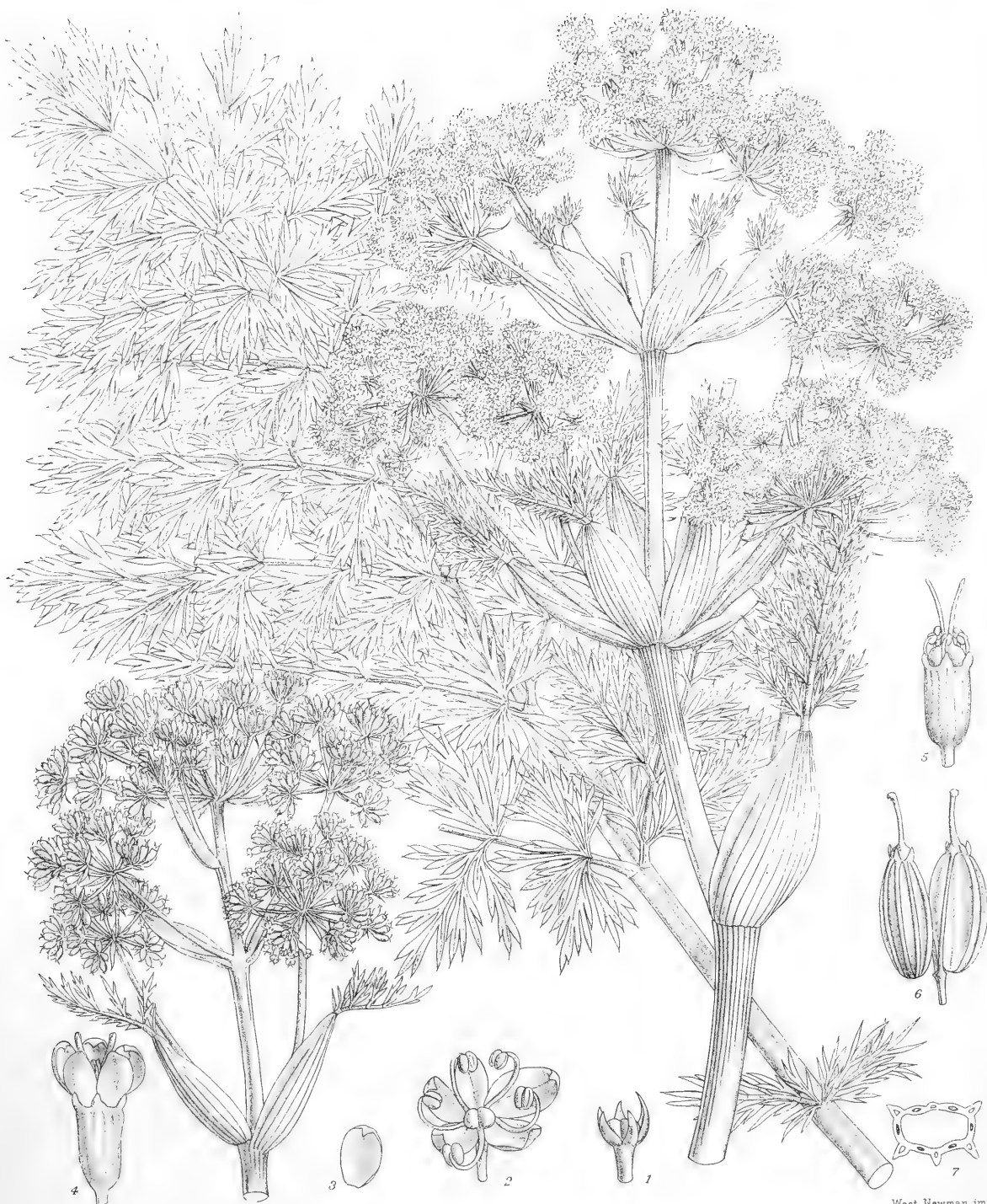
The remarkable plant figured on this plate was discovered by Mr. H. H. Travers in 1863 during his first visit to the Chatham Islands. The collections formed on that occasion were placed in the hands of the late Baron Mueller, and were worked out in his little book entitled "The Vegetation of the Chatham Islands," published in 1864. Our plant was described and figured, but evidently from imperfect material, under the name of *Gingidium Dieffenbachii*, the specific name being intended to commemorate the services to botanical science of Dr. Ernst Dieffenbach, who was the first to examine the botany of the group. According to Mueller, the plant was gathered "in damp places under cliffs at the seashore"; but he gives no information as to whether it was abundant or rare. I understand, however, that it was observed in small quantity during Mr. H. H. Travers's second visit in 1871, although I have seen no specimens collected at that time. No further information was obtained until about 1895, when Mr. F. A. D. Cox forwarded flowering and fruiting specimens to Mr. Kirk. These formed the basis of the description given in his "Students' Flora" and of mine printed in the Manual. Since then, through the kind action of Mr. F. A. D. Cox and Captain Dorrien-Smith, I have received a much better series of specimens, from which the accompanying plate has been prepared.

Previous writers have held very diverse views as to the systematic position of our plant. As already stated, Mueller associated it with Forster's *Gingidium*; Hooker transferred it to *Ligusticum*; while in the "Index Kewensis" it was placed in *Angelica*. Mr. Kirk disposed of it in *Aciphylla*, making the remark that "it will probably form the type of a new genus." This latter view I believe to be correct. It differs from the typical *Ligustica* in the flattened and conspicuously winged fruit, one carpel being 3-winged and the other 2-winged, or very rarely both carpels are 3-winged. The vittæ are unusually large, and are either 1 or 2 in the interspaces, with 2 or 3 on the commissural face. From *Angelica* it is separated by the equally winged fruit, by the smaller number of wings (or ribs), and by the number being unequal in the two carpels. It has much of the habit of *Aciphylla*, although the leaves and the bracts are never spinescent; but differs in the flattened and winged carpels, and in the smaller number of wings (or ribs) to each carpel, to say nothing of the much larger vittæ. Believing that it is best treated as a separate genus, Mr. Hemsley and myself have described it under the name of *Coxella*. This will commemorate the services to botanical science of Mr. F. A. D. Cox, of Whangamarino, Chatham Islands. During a lengthened residence in this remote outlier of the Dominion Mr. Cox has regularly and consistently collected specimens of the flora of the islands, communicating them to most New Zealand botanists, together with much valuable information. It is largely through his assistance in supplying material that our present knowledge of the Chatham Islands flora is in such a satisfactory position.

At the present time *Coxella Dieffenbachii* is exceedingly rare, if not tending towards extinction, and is apparently confined to a few stations on the precipitous slopes of cliffs in the southern portion of the islands. In an interesting paper by Captain Dorrien-Smith, entitled "An Attempt to introduce *Olearia semidentata*

into the British Islands," printed in the Kew Bulletin for 1910 (pp. 120-126), and which contains much information of value respecting the vegetation of the Chatham Islands, Captain Dorrien-Smith gives an account of a visit to two of the few localities known for *Coxella*, accompanying his remarks with an excellent photograph of the plant in its natural habitat. He suggests that its present scarcity is due to the depredations of cattle, which eat it readily wherever they can get at it. A parallel case exists in *Myosotidium nobile*, which once fringed the sea-coast for miles, but which now, through the combined attacks of sheep and pigs, hardly exists in the wild state, although, fortunately, well established in cultivation.

PLATE 64. *Coxella Dieffenbachii*, drawn from specimens collected for Mr. F. A. D. Cox at Te Tuku, Chatham Islands. A, male plant; B, female; C, fruit. Fig. 1, bracts (enlarged); 2, male flower ($\times 7$); 3, same with petals and stamens removed ($\times 7$); 4, petal ($\times 7$); 5 and 6, front and back view of anthers ($\times 8$); 7, female flower ($\times 7$); 8, the same with the petals removed, showing the sterile stamens ($\times 7$); 9, the same with the stamens removed also ($\times 7$); 10, petal ($\times 10$); 11, fruit ($\times 2$); 12 and 13, transverse sections of fruit ($\times 7$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

LIGUSTICUM HAASTII, *F. Muell.*

PLATE 65.—LIGUSTICUM HAASTII.

FAMILY UMBELLIFERÆ.]

[GENUS LIGUSTICUM, LINN.

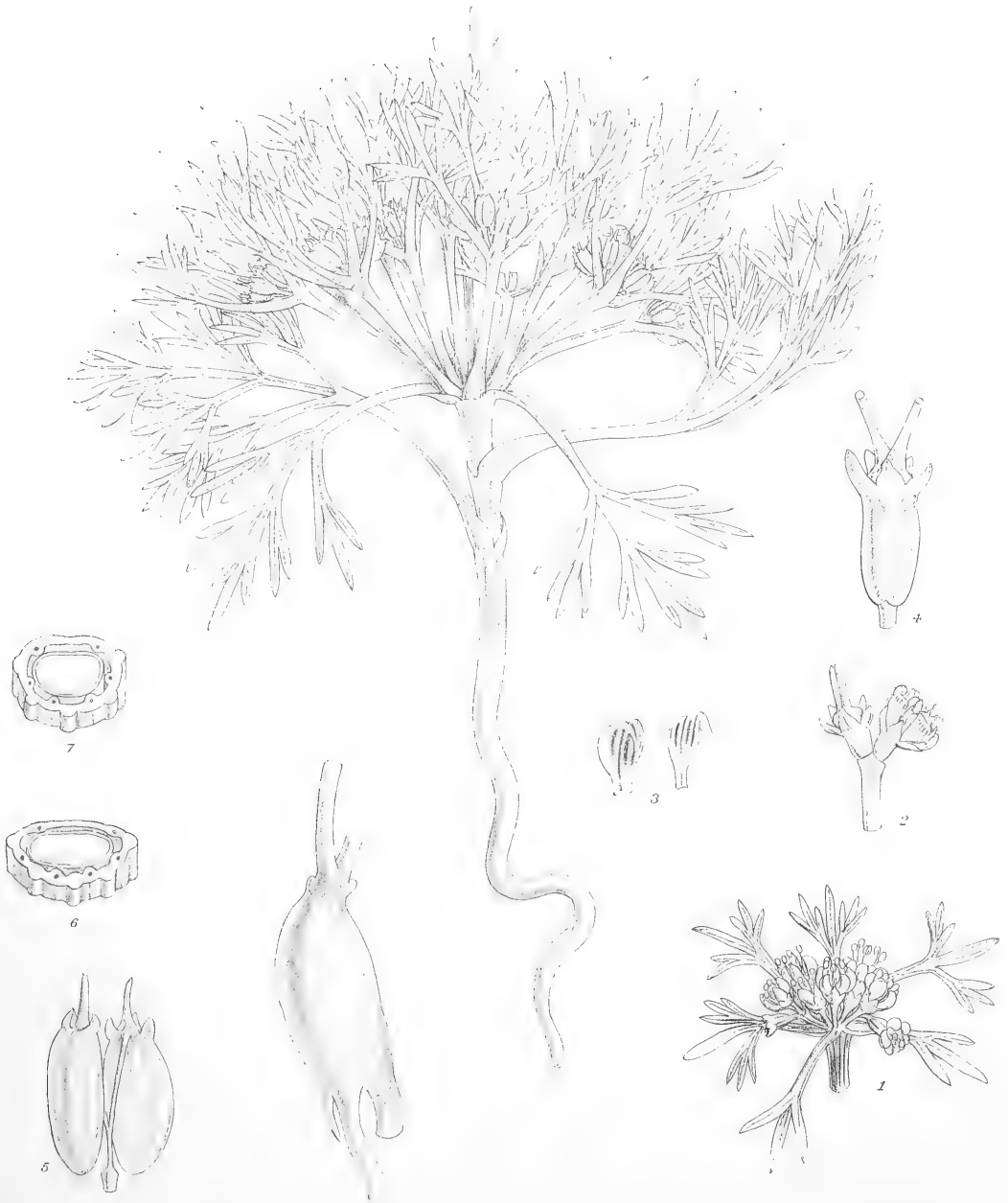
Ligusticum Haastii, F. Muell. ex Hook. f. *Handb. N.Z. Fl.* 95; *Cheesem. Man. N.Z. Fl.* 217.

Ligusticum Haastii is another prominent alpine plant discovered by Sir Julius von Haast during his many explorations in the Southern Alps. So far as I can ascertain, his first specimens were collected in the summer of 1861, on the mountains flanking the Rangitata and Ashburton Valleys. He appears to have forwarded some of them to Baron Mueller, of Melbourne, who suggested the name under which, a few years later, the species was described by Sir J. D. Hooker. Subsequent investigators have found that it is widely distributed in the central portions of the Southern Alps, particularly in the districts subject to the large western rainfall, where it is a prominent constituent of the subalpine meadows. It is most plentiful at an altitude of about 3,000 ft., but descends as low as 1,500 ft. in several localities, and I have seen it as high as 5,000 ft. Its northern limit appears to be on Mount Stokes, near Pelorus Sound; but as a rule it is rare and local in the north-eastern portion of the South Island. In the Nelson Provincial District I have not myself seen it further north than the mountains between the Clarence and the Waiau; but on the western side of the Island it is more frequently seen—in fact, Mr. Townson informs me that it is a most abundant plant on all the coastal mountains as far as Mokihinui, and possibly farther north.

L. Haastii is related on the one side to *L. Lyallii*, and on the other to *L. brevistyle*, but is abundantly distinct from both. From the first it can be separated at a glance by the much more finely cut membranous leaves, the segments of which are bristle-pointed. The latter differs in its much smaller size, more slender habit, sparingly divided leaves, and very short styles.

In another publication ("The Subantarctic Islands of New Zealand," vol. ii, p. 408) I have mentioned that in the "Genera Plantarum" Mr. Benthams transferred to *Aciphylla* all the southern species referred by Hooker to *Ligusticum*, and recently several botanists have followed his lead. No doubt the floral and carpological characters of the two groups are very similar; but, on the other hand, the habit of the true *Aciphyllæ*, with their rigid and coriaceous spinous leaves, and paniculate inflorescence protected by spinous bracts, is most distinctive. I feel sure that Mr. Benthams would never have made the proposal if he had been familiar with *Aciphylla* in a living state. In any case, the two groups would have to be separated as subgenera, which is practically the same arrangement under another name without its inconveniences. If the southern plants placed by Hooker in *Ligusticum* are to be excluded from that genus (and it may be remarked that the numerous vittæ of the typical *Ligustica* constitute a marked difference), then Hooker's genus *Anisotome* should be revived for the reception of the greater portion of them.

PLATE 65. *Ligusticum Haastii*, leaf, and the inflorescence from male and female plants, drawn from specimens collected in the Mount Cook district, Canterbury, at an altitude of 4,000 ft. Fig. 1, male flower, with the petals and stamens removed ($\times 6$); 2, male flower, complete ($\times 6$); 3, petal ($\times 6$); 4, female flower ($\times 6$); 5, the same with the petals removed ($\times 6$); 6, fruit ($\times 5$); 7, transverse section of same ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

LIGUSTICUM CARNOSULUM, Hook. f.

PLATE 66.—LIGUSTICUM CARNOSULUM.

FAMILY UMBELLIFERÆ.]

[GENUS LIGUSTICUM, LINN.

Ligusticum carnosulum, Hook. *J. Handb. N.Z. Fl.* 96; *Cheesem. Man. N.Z. Fl.* 219.

On most of the higher mountains of New Zealand immense slopes of dry rocky debris occur, which are locally known as "shingle-slips." In not a few localities these cover the sides of the mountains from base to summit, and present an aspect almost indescribably bare, barren, and desolate, apparently devoid of all vegetation. But on closer examination it is seen that they support a peculiar flora, composed of plants of very diverse relationships—buttercups, chickweeds, clove-worts, umbellifers, composites, figworts, grasses, and many others. Most of these are of small size and low stature, while all have long and often tortuous roots. Some are succulent, others are covered with a felted mass of hairs, and nearly all are a peculiar gray-green, closely matching the colour of the shingle. From this assemblage of highly specialized plants it would be difficult to select one more singular than the subject of this plate.

Ligusticum carnosulum was first collected by Sir Julius von Haast on shingle-slopes on Mount Torlesse in 1861, and has been observed in the same locality by many other botanists. It is, however, by no means a common plant, and is fast becoming scarcer through the combined attacks of sheep and rabbits. The most northern station known to me is on the mountains flanking the Wairau Valley, Nelson, where I gathered it many years ago. Mr. Kirk has collected it on shingle-slopes on Mount Captain, in the Amuri district; and during a hasty visit paid by myself to Lake Tennyson some years ago I noticed it in some quantity. As far back as 1864 or 1865 Mr. J. D. Enys collected it on the Black Range and other mountains of the Middle Waimakariri basin, where it has since been observed by myself and others. It was gathered by Mr. Armstrong in the Rangitata district, where it has also been noticed by Dr. Cockayne and Mr. Laing; but I know of no locality farther south, although I have specially searched for the plant on the mountains near Lake Tekapo, also in the Mount Cook district and other localities in southern Canterbury. Its altitudinal range appears to be from 3,000 ft. to 6,000 ft.

The nearest ally of *L. carnosulum* is undoubtedly my *L. diversifolium* (Manual, p. 1139). This has the same habit and foliage, and the flowers and fruit are almost indistinguishable. But the latter plant differs widely in the involucreal leaves, which are linear, entire, and much shorter than the umbel; whereas (as will be seen from the plate) they are ternately multifid and much longer than the umbel in *L. carnosulum*. It may be remarked that *L. carnosulum* and *L. diversifolium* differ widely from all the other *Ligustica* and *Aciphyllæ* hitherto found in New Zealand in the fruit, which is not at all winged, but simply furnished with low rounded ridges (see figs. 5, 6, and 7). When the southern species of *Umbelliferae* are systematically worked up I anticipate that these two species will find a home in another genus.

It has been pointed out by Diels and others that *L. carnosulum* has been largely modified to suit the peculiar nature of its environment. The long and fleshy tortuous rootstock, with its stringy roots, is plainly adapted to suit the never-ending combat the plant has to wage with the moving shingle. The leaves are finely divided, so as to present as little surface as possible to the

rain of shingle-dust which in high winds must often fall upon them, while the divisions themselves are unusually elastic, so that Diels has compared them to tiny indiarubber tubes. The protection afforded to the flowers and ripening fruit by the involueral leaves within which they are enclosed is another adaptation of considerable importance.

PLATE 66. *Ligusticum carnosulum*, drawn from specimens collected on the Black Range, Middle Waimakariri, Canterbury Alps, at an altitude of 4,000 ft. Fig. 1, inflorescence and involueral leaves ($\times 2$); 2, male and female flowers ($\times 5$); 3, petals ($\times 8$); 4, female flower, with petals removed ($\times 8$); 5, fruit ($\times 5$); 6 and 7, transverse sections of a single carpel ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

LIGUSTICUM PILIFERUM, Hook. f.

PLATE 67.—LIGUSTICUM PILIFERUM.

FAMILY UMBELLIFERÆ.]

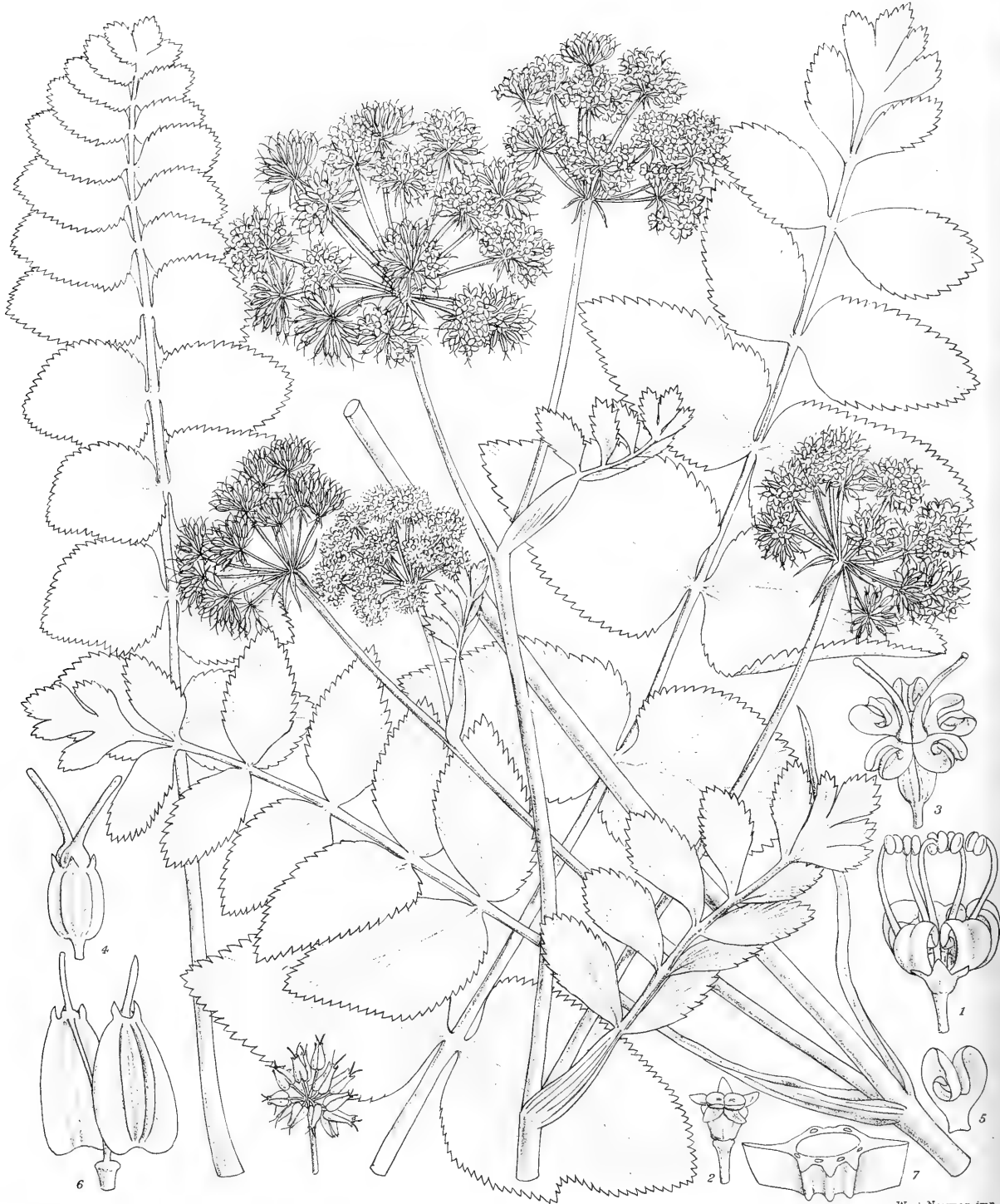
[GENUS LIGUSTICUM, LINN.

Ligusticum piliferum, Hook. f. *Handb. N.Z. Fl.* 96; *Cheesem. Man. N.Z. Fl.* 220.

Ligusticum piliferum was first discovered by Sir Julius von Haast in 1861 on Mount Torlesse, well known to the residents of Christchurch as the nearest prominent outlier of the Southern Alps. As it attains a height of nearly 6,500 ft., and stretches from the Waimakariri River to Porter's Pass, it is high enough and massive enough to present many diversified plant-stations of rock, shingle-slope, and subalpine meadow; and hence no small number of alpine plants first became known from specimens obtained from such a convenient and accessible collecting-ground. In the case of *L. piliferum*, it was soon found in other localities. Haast obtained it in several additional stations in the Southern Alps; Hector and Buchanan gathered it in the Lake district of Otago; Travers in the Hurunui Valley and other localities in northern Canterbury. Since then it has been found by Mr. Macmahon on Mount Stokes, near Pelorus Sound, and by myself on the Mount Arthur Range, in north-west Nelson, these two stations constituting its northern limit. Roughly speaking, it can be said to be an abundant mountain-plant from thence to the south-west of Otago, chiefly between the elevations of 2,500 ft. and 5,000 ft.

L. piliferum is a very distinct species, and I do not know any plant that can be said to be closely allied. Its stout fleshy stems, bold foliage, and large umbels of white flowers make it a very conspicuous and showy plant, and it is a great ornament to the rocky banks and ledges on which it delights to grow.

PLATE 67. *Ligusticum piliferum*, drawn from specimens collected on Mount Arthur, Nelson, at an elevation of 4,500 ft. Fig. 1, flower ($\times 7$); 2 and 3, the same with the petals and stamens removed ($\times 7$); 4, petal ($\times 7$); 5 and 6, front and back view of anthers ($\times 7$); 7, fruit ($\times 12$); 8, transverse section of fruit ($\times 12$).



M. Smith del.
J.N. Fitch lith

West, Newman imp.

ANGELICA GINGIDIUM, Hook. f.

PLATE 68.—ANGELICA GINGIDIUM.

FAMILY UMBELLIFERÆ.]

[GENUS ANGELICA, LINN.

Angelica Gingidium, Hook. *j. Handb. N.Z. Fl.* 97; *Cheesem. Man. N.Z. Fl.* 222.

Ligusticum Gingidium, Forst. *Prodr.* n. 140.

This well-known plant was one of those discovered during Cook's first voyage, having been collected by Banks and Solander in Queen Charlotte Sound in January, 1770. Dr. Solander described it in his "Primitiæ Floræ Novæ Zelandiæ" under the name of *Ligusticum anisatum*, and an excellent drawing was prepared for the Banksian plates. But, as already explained in this work, Solander's names were never actually published, and consequently have no standing in systematic botany. It was again collected by the Forsters during Cook's second voyage, and was published in their "Characteres Generum Plantarum" (p. 41, t. 21), with an excessively crude and imperfect plate, as the type of a new genus under the name of *Gingidium montanum*. George Forster, in the later "Prodromus" (p. 22), abandoned *Gingidium* as a separate genus, and referred the plant to *Ligusticum* as *L. Gingidium*. Hooker, in the "Flora Novæ Zelandiæ" (i, 89) included it in his genus *Anisotome*, but in the "Handbook" (p. 97) transferred it to *Angelica*, where it has since remained. From the above it is obvious that *montanum* is the oldest specific name, and a purist in nomenclature would undoubtedly call the plant *Angelica montana*. But I think it can be reasonably objected that the authors of the first specific name, not long after its publication, themselves proposed the substitution of the second name, and that at the present time nothing but confusion could result from the change.

A. Gingidium has a wide distribution. In the North Island, however, it is far from common, attaining its northern limit, so far as I am aware, at Marikopa, a little to the south of Kawhia, where it was observed a few years ago by Mr. E. Phillips Turner. In the South Island it is (or rather was) a very common plant, stretching from Nelson to the south of Otago, and with an altitudinal range stretching from sea-level to quite 4,000 ft. It is one of the few New Zealand species that show a marked preference for calcareous soils, although by no means restricted to such localities. It is greedily sought after by cattle and sheep, with the natural result that it is now comparatively scarce in districts where it was once abundant. The whole plant is strong-scented and aromatic, and is generally known in country districts in the South Island by the name of "aniseed," from the resemblance of its odour to that of the well-known Anise. It may be remarked that Solander's specific name of *anisatum* was applied for the same reason. He says "semina ut et tota planta aromatica sapore Fœniculi dulcis, odore seminum Anisi."

PLATE 68. *Angelica Gingidium*, drawn from specimens gathered by Mr. F. G. Gibbs, in the Maitai Valley, Nelson, and in the Mount Cook district by myself. Fig. 1, male flower ($\times 8$); 2, male flower, with the petals and stamens removed, showing the calyx and rudimentary ovary ($\times 8$); 3, female flower ($\times 8$); 4, the same with the petals removed ($\times 8$); 5, petal ($\times 8$); 6, fruit ($\times 6$); 7, transverse section of fruit ($\times 12$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

ANGELICA ROSAEFOLIA, Hook.

PLATE 69.—ANGELICA ROSÆFOLIA.

FAMILY UMBELLIFERÆ.]

[GENUS ANGELICA, LINN.

Angelica rosæfolia, Hook. Ic. Plant. t. 581 : *Cheesem. Man. N.Z. Fl.* 221.

For the discovery of this curious plant we have to go back as far as October, 1769, the time of Cook's first visit to New Zealand. It was then collected by Banks and Solander on or near the site of the present town of Gisborne, and a few days later was observed at "Tigadu" (Anaura Bay) and at Tolaga Bay. It was also gathered by them at Opuragi (Mercury Bay), and on Motuarohia Island, in the Bay of Islands. An excellent description was written by Solander for his manuscript "Primitiæ Floræ Novæ Zelandiæ" under the name of *Ligusticum aromaticum*, and a very faithful drawing was prepared for the Banksian plates. Notwithstanding all this, Solander's name and drawing both remained unpublished, and the plant was not mentioned by any of the earlier writers on the New Zealand flora, as Forster, A. Richard, and Allan Cunningham; in fact, it was not until seventy-five years had elapsed that it again came under the notice of the botanical world.

Some time before 1843 specimens were obtained in some locality in the North Island by Mr. Colenso, and forwarded to Sir W. J. Hooker at Kew. Soon after, the plant was also gathered in the East Cape district by Dr. Sinclair, and from these two sources it was figured and described in the "Icones Plantarum" (t. 581) under its present name. Sir J. D. Hooker, in the "Flora Novæ Zelandiæ" transferred it to his genus *Anisotome*, but in the "Handbook" he replaced it in *Angelica*. In neither publication does he mention Banks and Solander as the first discoverers—in fact, through some curious misconception he applied Solander's name of *Ligusticum aromaticum* to the mountain-plant which is now well known under that appellation. It is hard to see how the mistake can have arisen, for neither Solander's description nor plate will suit the present *L. aromaticum*, and there is no proof that he ever collected it. Fortunately, however, as Solander's name was never actually published, its use for a different species is admissible; so that there is no occasion to disturb the existing nomenclature.

Angelica rosæfolia is mainly a coastal plant, and I have not myself seen it any great distance from the sea. Its northern limit is on the Three Kings Islands, where I observed it in 1887 and again in 1889. From thence it is not uncommon southwards as far as Hawke's Bay on the east coast and Raglan on the west. Inland it has been recorded from the Ruahine Range by Mr. Harding, and the Upper Rangitikei by Mr. Buchanan. I have not seen specimens from the South Island, but it has been recorded from Akaroa (Raoul, *vide* Hooker) and from Canterbury, without precise locality, by Travers and Armstrong.

This species and the allied *A. geniculatus* are anomalous in the *Umbellifera* from their scrambling or subscandent stems. The leaflets are also provided with a pair of minute stipellæ at the base: one on the upper surface, the other below—a very unusual character in the family.

PLATE 69. *Angelica rosæfolia*, drawn from specimens collected on the Little Barrier Island by Miss Shakespear. Fig. 1, pedicel (enlarged); 2, base of a pair of leaves, showing the minute stipellæ (enlarged); 3, male flower ($\times 10$); 4, the same with the petals and stamens removed, showing the calyx and the rudimentary ovary ($\times 10$); 5, petal ($\times 12$); 6, female flower ($\times 10$); 7, the same with the petals removed ($\times 10$); 8, petal from female flower ($\times 12$); 9 and 10, fruit ($\times 8$); 11, transverse section of fruit ($\times 14$).



M. Smith del.
J.N. Fitch lith.

West Newman imp.

STILBOCARPA LYALLII, Armstr.

PLATE 70.—STILBOCARPA LYALLII AND STILBOCARPA
POLARIS.

FAMILY ARALIACEÆ.]

[GENUS STILBOCARPA, A. GRAY.

Stilbocarpa Lyallii, *Armstr. in Trans. N.Z. Inst.* xiii (1881), 336.

Aralia Lyallii, *T. Kirk in Trans. N.Z. Inst.* xvii (1885), 295.

Stilbocarpa polaris, *A. Gray, Bot. U.S. Expl. Exped.* 714; *Cheesem. Man. N.Z. Fl.* 227.

From the point of view of geographical distribution the genus *Stilbocarpa* is one of the most interesting found in the New Zealand area. It has no near allies; and although in technical characters it approaches *Aralia* on the one side, and the herbaceous species of *Panax* on the other, the affinity which it possesses with either is obscure and inconclusive. At the same time, these affinities appear to be sufficient to preclude the possibility of the genus having developed anywhere close to its present area of distribution. Consequently, the problem of what its ancestry has been, from what lands it has wandered, and how it arrived in its present habitat, become questions of some moment; and although answers cannot be provided at the present time, we may hope that patient inquiry and observation may yet supply them.

The discovery of *Stilbocarpa* dates back to 1840, when *S. polaris* was collected on the Auckland Islands successively by Dr. Holmes, of the American Exploring Expedition; by Admiral D'Urville, the commandant of the French ships 'L'Astrolabe' and 'La Zélée'; and by Sir J. D. Hooker, who, as is well known, accompanied the Antarctic expedition of Sir James Clark Ross. It was made known to the scientific world in 1843, under the name of *Aralia polaris*, through a beautiful plate issued in advance of the "Botany of the 'Astrolabe' and 'Zélée.'" Through a succession of mishaps, however, the letterpress for this and other plates did not appear until ten years later. In the meantime, it was figured by Hooker in the "Icones Plantarum"; and his description given in the "Flora Antarctica," published in 1844, was the first good account to appear. In the "Flora Novæ Zelandiæ," issued in 1853, Hooker expressed the opinion that the plant was "certainly of a different genus from *Aralia* proper, but in the present confused state of the natural order it is not expedient to separate it in this local flora on grounds which on extensive examination of the order may prove not to be the legitimate ones." Further on he proposed the sectional name of *Stilbocarpa*, in allusion to the shining fruit. Dr. Asa Gray, writing in 1854 in the "Botany of the United States Exploring Expedition" (vol. i, p. 714), definitely established *Stilbocarpa* as a distinct genus, pointing out that the acetabuliform fruit and styles fewer than the petals must exclude the plant from *Aralia*.

All visitors to the Auckland and Campbell Islands agree in stating that *S. polaris* is an abundant plant, ranging from sea-level to a considerable height on the hills. In 1880 Professor J. H. Scott collected it on Macquarie Island, remarking that it "is found all over the island growing in large patches"; and Mr. A. Hamilton also obtained it in his later visit of 1894. In 1890 Mr. T. Kirk recorded it as plentiful on Antipodes Island. The physiognomy of the plant has been so often described that no detailed account need be given here. As Hooker has well remarked, it is "one of the most handsome and singular of the vegetable productions in the group of islands it inhabits, which certainly contains a greater proportion of large and beautiful plants, relatively to the whole vegetation, than any country with which I am acquainted."

Stilbocarpa Lyallii was originally discovered in Stewart Island by Dr. Lyall in the year 1848. Both in the Flora and the "Handbook" Sir J. D. Hooker included it in his circumscription of *S. polaris*, although in the last-mentioned publication he said that "Lyall's Southern Island specimen wants the long bristles, and may belong to another species." In 1881 Mr. J. B. Armstrong,

who had cultivated *Lyall's* plant side by side with *S. polaris* in the Christchurch Botanical Gardens, described it as a distinct species, relying principally on the upper surface of the leaves being nearly glabrous and devoid of the long and stout bristly hairs so conspicuous in *S. polaris*. In 1885 Mr. T. Kirk, who had good opportunities of studying *S. Lyallii* in a wild state in Stewart Island, pointed out that it departed from the characters of *Stilbocarpa* in the 2-celled ovary and the globose fruit not hollowed at the apex. He therefore considered that it should be transferred to *Aralia*, and this view was maintained in the "Students' Flora." In 1898 Dr. Harms, in "Die Naturlichen Pflanzenfamilien," restored it to *Stilbocarpa*, placing it in a separate section, to which he applied the name of *Kirkophytum*. At the present time this view is generally accepted by botanists who are familiar with the plant.

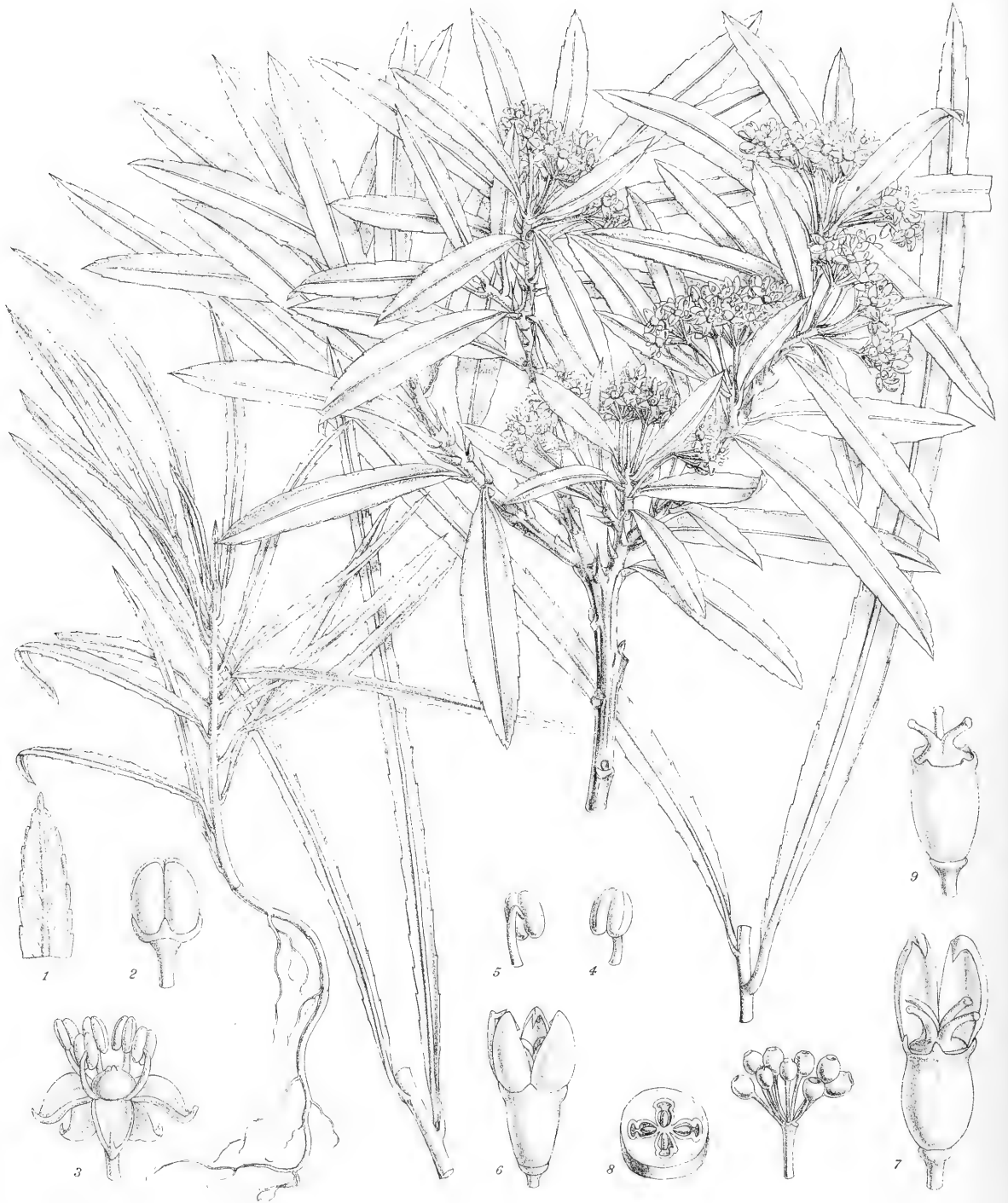
Stilbocarpa Lyallii, according to Kirk and Cockayne, is fairly abundant as a coastal plant in Stewart Island and on the small islands in Foveaux Strait. Mr. Kirk has also recorded it from Coal Island, in Preservation Inlet; but as it was "identified from the deck of a passing steamer" a slight element of doubt attaches to this locality. While very similar to *S. polaris* in habit and appearance, *S. Lyallii* differs markedly in possessing strongly arcuate stolons sometimes almost 3 ft. in length. According to Mr. Kirk, "these at first are suberect, but gradually become inclined or arched until the terminal bud comes in contact with the ground, when roots are given off, and a new plant is speedily developed." In this way a single plant soon forms a large patch covering several square yards. The differences in the glabrous under-surface of the leaves and the 2-celled ovary have already been mentioned.

A third species of *Stilbocarpa* is the plant discovered on the Snares by Mr. Kirk in 1890, and described by him under the name *S. Lyallii*, var. *robusta*. He states that it is "the most striking herbaceous plant on the island," and that "it is sometimes 3 ft. high or more, with noble orbicular reniform leaves over 2 ft. in diameter. It differs from the typical form in wanting the remarkable stolons of that plant, in the petioles being very stout, flat on the upper surface and concave beneath, giving a plano-convex section, and in their being nearly solid instead of terete, thin-walled, and fistulose. The flowers also, although forming equally large masses with the type, are individually smaller, and invariably of a dull pale-yellow hue, never lurid; but there is no structural difference, although it must be admitted that at first sight the plant appears to depart widely from the type." Notwithstanding the opinion thus expressed by its discoverer, it appears to me that the plant fully deserves the rank of a species. This is also the opinion of Dr. Cockayne, who has had opportunities of examining it in its native home, and who has proposed for it the name of *S. robusta*.

The following synopsis of the species of *Stilbocarpa* may be of service:—

- | | |
|--|------------------------|
| A. STILBOCARPA. Ovary 3-4-celled. Fruit hollowed at the apex. | |
| Stolons not developed. Upper surface of leaves more or less clothed with stout bristly hairs. Flowers yellowish-green with a purplish centre | 1. <i>S. polaris</i> . |
| B. KIRKOPHYTUM. Ovary 2-celled. Fruit globose, not hollowed at the apex. | |
| Stolons not developed. Upper surface of leaves glabrous or nearly so. Flowers yellowish | 2. <i>S. robusta</i> . |
| Arcuate stolons strongly developed. Upper surface of leaves glabrous or nearly so. Flowers reddish-purple | 3. <i>S. Lyallii</i> . |

PLATE 70. The leaf that of *Stilbocarpa Lyallii*; the inflorescence and dissections from *S. polaris*. Specimens from plants cultivated in the garden of the late Mr. H. J. Matthews, Dunedin. (NOTE.—It was intended to figure *S. Lyallii* alone, but through an accidental mistake the inflorescence of *S. polaris* was sent to the artist.) Fig. 1, flower-bud ($\times 5$); 2, male flower ($\times 5$); 3 and 4, anthers, front and back view ($\times 5$); 5, female flower ($\times 5$); 6, longitudinal section of same ($\times 5$); 7, fruit, nearly ripe ($\times 5$); 8, longitudinal section of ripe fruit ($\times 5$); 9, seed ($\times 8$); 10, longitudinal section of same.



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PANAX LINEARE, Hook. f.

PLATE 71.—PANAX LINEARE.

FAMILY ARALIACEÆ.]

[GENUS PANAX, LINN.

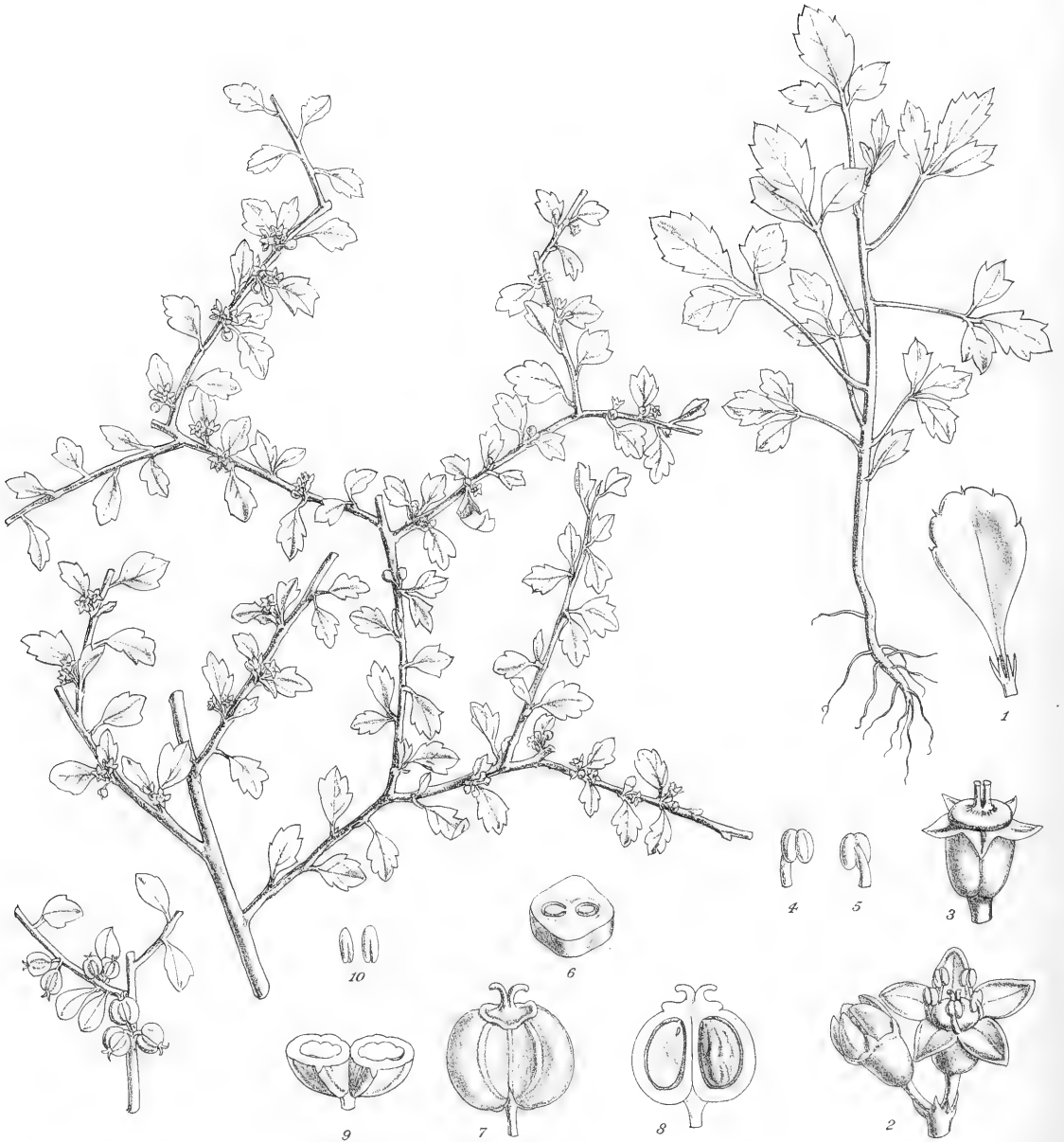
Panax lineare, Hook. f. *Fl. Nov. Zel.* i, 93; *Cheesem. Man. N.Z. Fl.* 228.

For the discovery of *Panax lineare* we are indebted to Dr. Lyall, the surgeon-naturalist to H.M.S. "Acheron," who in 1848 collected it in Chalky Bay, on the south-west coast of Otago. His specimens—only two in number—were forwarded to Sir J. D. Hooker, and were described by him in the "Flora Novæ Zelandiæ" (vol. i, p. 93); but as Lyall only obtained the female flowers, and did not notice the very different foliage of the young plants, the account given was necessarily imperfect. In 1863 Sir James Hector and Mr. Buchanan gathered it in Dusky Sound; but it was not until 1876, when it was found by Mr. J. D. Enys and Mr. T. Kirk in the Upper Waimakariri, Bealey Gorge, and adjacent districts, that flowers of both sexes were obtained, and a series of specimens collected showing the remarkable changes the foliage passes through during the growth and development of the plant. In 1881 I observed it in great abundance on the Mount Arthur Plateau, Nelson, and in the upper part of the Takaka Valley. Since then it has been observed in many of the sub-alpine forests along the central chain of the Southern Alps, especially on the western side, the most southern locality known to me being Preservation Inlet. It reaches an altitude of over 4,000 ft. in north-west Nelson, but descends to 1,500 ft. or lower on the coastal ranges near Westport. In the Sounds of the south-west coast of Otago it probably comes down to sea-level.

A reference to the plate will show that the foliage of the young seedling is very narrow-linear, and from 2 in. to 3 in. in length by about $\frac{1}{4}$ in. in breadth. As the plant increases in size the leaves also increase in length, so that a young tree 4 ft. or 5 ft. in height frequently has leaves 10 in. in length by $\frac{1}{4}$ in. in width. In older stages the leaves gradually become shorter, so that in flowering examples they are frequently less than 2 in. long, with a breadth of from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. The leaf-change through which the species passes thus resembles that of *Pseudopanax crassifolium* var. *unifoliolatum*, but is not so conspicuous, and the leaves of the young plant are never deflexed, as they usually are in one of the stages of *P. crassifolium*.

But for the long recurved styles, and ovary usually (but not always) with less than 5 cells, *P. lineare* might be referred to *Pseudopanax*, with the simple-leaved species of which it certainly has some affinity. *Pseudopanax crassifolium*, *P. ferox*, and *P. chathamicum*, together with *Panax lineare*, would form a very natural group, considered from the point of view of the leaf-changes which take place between the seedling and adult plant.

PLATE 71. *Panax lineare*, adult in the flowering stage, together with examples showing the changes of leaf-form between the seedling and the mature plant; the whole of the specimens collected by Mr. F. G. Gibbs in the Cobb Valley, north-west Nelson. Fig. 1, tip of leaf ($\times 4$); 2, flower-bud, showing 4 petals ($\times 4$); 3, male flower, showing 5 petals ($\times 4$); 4 and 5, back and front view of stamens ($\times 6$); 6, female flower ($\times 4$); 7, female flower, with two of the petals removed, showing the styles ($\times 6$); 8, transverse section of ovary ($\times 6$); 9, female flower, with three styles, the petals removed ($\times 6$).



M. Smith del
J. N. Fitch lith

West, Newman imp.

PANAX ANOMALUM, Hook.

PLATE 72.—PANAX ANOMALUM.

FAMILY ARALIACEÆ.]

[GENUS PANAX, LINN.

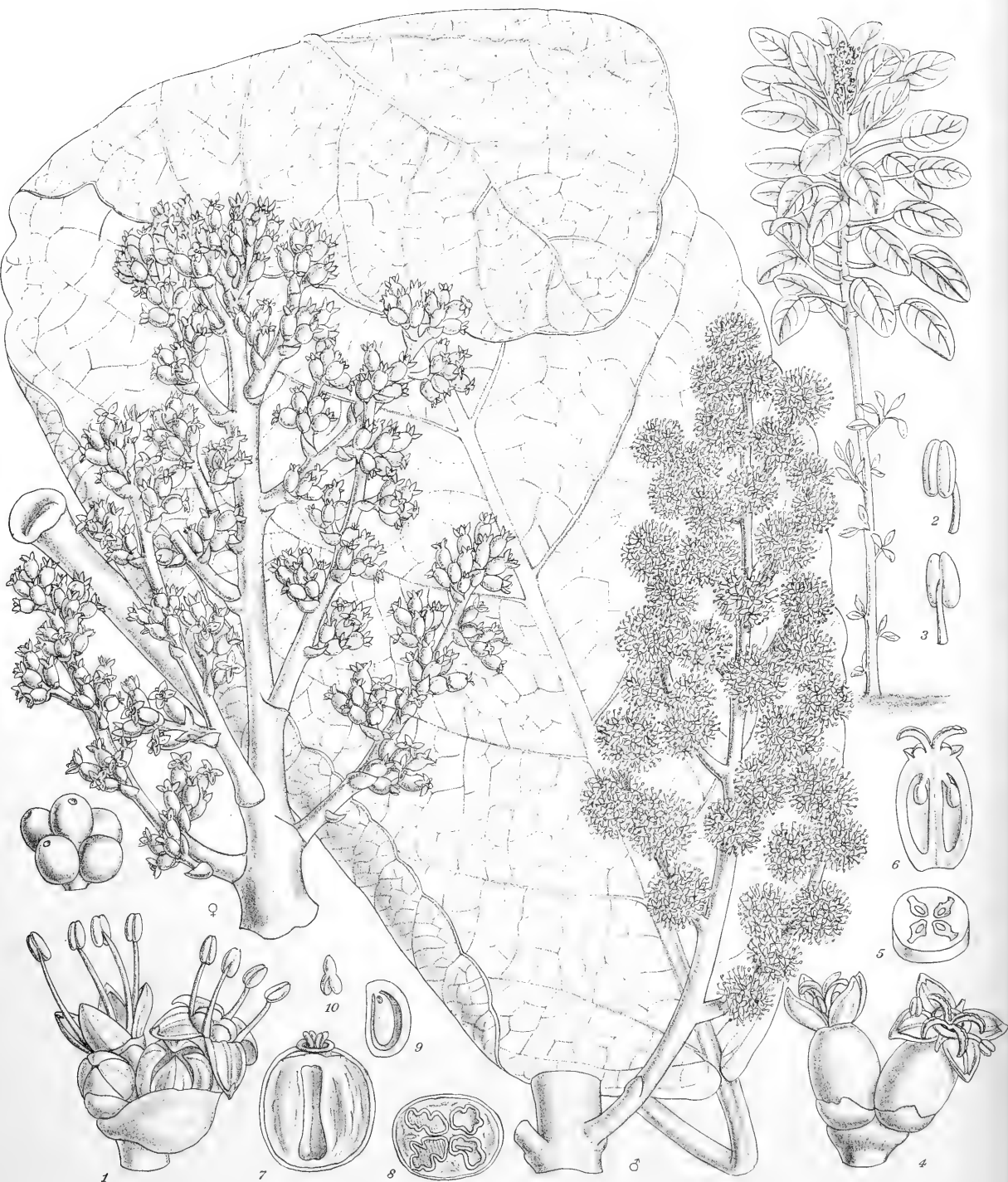
Panax anomalum, Hook. in *Lond. Journ. Bot.* ii (1843), 422; *Cheesem. Man. N.Z. Fl.* 230.

The typical form of this curious plant is one of the many interesting discoveries made by Mr. Colenso during the early part of his long and active residence in New Zealand. He first observed it in swampy forests by the Waikato River in the year 1842, and specimens collected by him in that locality were figured and described by Sir W. J. Hooker in the following year. Since then it has been noted in many places between Kaitaia, in the extreme north, and the valley of the Waikato. The var. *microphyllum*, which is the form selected for illustration here, has a much more extensive and more southern distribution. It was first collected by Mr. Bidwill in some locality in the Nelson Provincial District, but is now known to range from the Middle Waikato to Southland, with an outlying locality in the Rakiahua Valley, Stewart Island. It occurs from sea-level to an altitude of 2,500 ft. or more. It differs from the type chiefly in the smaller size, smaller and often narrower leaves, and more glabrous habit.

Panax anomalum, as it was well named by Sir W. J. Hooker, is quite unlike any other member of the genus. Its small size, setose branchlets, and few-flowered umbels, often reduced to a single flower, are very remarkable characters; but, in addition, its widely divaricating and often interlaced or zigzag branches give it a most peculiar aspect, altogether different from that of any of its allies, but very similar, so far as superficial characters are concerned, to a considerable number of plants belonging to widely separated families, such as *Melicotus micranthus*, *Melicope simplex*, *Myrsine divaricata*, *Paratrophis heterophylla*, several *Coprosma*, and young states of *Eleocharis Hookerianus* and *Pennantia corymbosa*. Most of these agree so closely in the mode of ramification, in the size, shape, and even colour of the leaf, and in the production of small and usually unisexual flowers, that it is almost impossible to distinguish them at a little distance; while dried specimens of several of them have been confounded by excellent botanists. To my mind, all attempts that have been made to explain why a number of plants of diverse relationships should have assumed a form so closely similar that they can hardly be distinguished without minute examination, or, in short, why they should apparently mimic a common standard of growth and habit, have fallen far short of solving the difficulties of the case. No sufficient reason has also been given for the curious fact that so many of these plants grow intermixed in large numbers, in some cases forming special associations of their own, and that their chief habitat is in alluvial soils or along the banks of rivers.

In the "Pflanzenfamilien" all the New Zealand species of *Panax* are referred to Miquel's genus *Nothopanax*, a course which has been followed by Dr. Cockayne. As explained in the Manual, I retain the species in *Panax* for the present because the classification of the family is admittedly in an unsettled condition, and because many changes are sure to follow when it is thoroughly worked up. In all probability the New Zealand species at present included in *Panax* (or *Nothopanax*) will ultimately find their way into more than one genus. For instance, I can hardly suppose that the botanists of the future will retain *P. anomalum* and *P. arboreum* in the same genus.

PLATE 72. *Panax anomalum* var. *microphyllum*, drawn from specimens collected at Norsewood, Hawke's Bay, and Foxhill, Nelson, adult and seedling. Fig. 1, unifoliate leaf from mature plant ($\times 4$); 2, fully expanded male flower and bud ($\times 8$); 3, female flower, with the petals removed ($\times 8$); 4 and 5, front and back view of anthers ($\times 10$); 6, transverse section of ovary ($\times 10$); 7, ripe fruit ($\times 4$); 8, longitudinal section of same, showing seeds ($\times 4$); 9, transverse section of same ($\times 4$); 10, embryo ($\times 12$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

MERYTA SINCLAIRII, *Seem.*

PLATE 73.—MERYTA SINCLAIRII.

(THE PUKA.)

FAMILY ARALIACEÆ.]

[GENUS MERYTA. FORST.

Meryta Sinclairii, Seem. in *Bonplandia*, x (1862), 295; *Cheesem. Man. N.Z. Fl.* 232.

Meryta Sinclairii, or puka, as it is generally called, is one of the most remarkable of the New Zealand trees, and is certainly one of the rarest. It was first observed by Mr. Colenso, who was shown by the Maoris a single tree growing in a Native cultivation at Paparaumu, Whangaruru Harbour, which they informed him had been brought from the Poor Knights Islands. It was surrounded by a high fence, and was strictly *tapu*, Mr. Colenso not being permitted access to it, or allowed to remove specimens. Major W. G. Mair was the next to visit the locality, and succeeded in obtaining specimens of the foliage, some of which were given to Dr. Sinclair. Later on Mr. Robert Mair obtained ripe fruit, which was also forwarded to Dr. Sinclair. This material, imperfect as it was, formed the basis of the descriptions given by Sir J. D. Hooker in the "*Flora Novæ Zelandiæ*," and in the later published "*Handbook*." About 1862 the tree was cut down by the Maoris, who resented the attempts made by Europeans to obtain specimens from it; but shortly afterwards a Mr. G. Henson discovered it in an indigenous condition on the Morotiri or Chickens Islands. In 1869 Captain F. W. Hutton and Mr. T. Kirk made a special visit to that locality, with the result of finding eight or nine plants. A few years later I visited the islands and saw thirteen old plants and a few seedlings. Mr. Reischek, who paid several visits to the Chickens while pursuing his ornithological researches, and who was familiar with the whole group, informed me that not more than thirty trees existed on the islands. He observed, however, a solitary specimen on the north side of the adjacent Hen Island. Mr. Sandager, who for several years was lightkeeper on the Fanal, or Mokohinou Islands, states that it is not found thereon; and its reported presence on the Poor Knights Islands, which has always rested on Maori authority alone, has been rendered very improbable by the fact that it was not observed during Dr. Cockayne's recent visit (see *Trans. N.Z. Inst.* xxxviii (1906), 353).

For many years the Chickens locality was the only one known. In 1889, however, I discovered it in great abundance on the Western King, one of the Three Kings Group, situated about thirty-eight miles to the north-west of Cape Maria van Diemen. In this locality it constituted the greater portion of the light bush which clothes the northern slopes of the island. Among the shrubby plants associated with it were *Myoporum laetum*, *Melicope ternata*, *Leptospermum scoparium* and *L. ericoides*, *Paratrophis Smithii*, and *Cordyline australis*. The undergrowth was composed of *Piper excelsum* var. *major*, *Hymenanthera novæ-zelandiæ*, *Asplenium lucidum*, *Pteris comans*, and *Davallia Tasmani*, a plant-association which cannot be matched in any other locality. During the same visit I observed from the deck of the steamer that it was equally plentiful on the top of the Eastern King; but as we failed to find any practicable way of ascending the cliffs which everywhere surround the island I can say nothing about the associated vegetation. Since then no fresh stations have been discovered, and we may fairly conclude that the Hen and Chickens and Three Kings Islands are the only localities for the species.

In a native state *Meryta Sinclairii* is a much-branched small tree from 12 ft. to 20 ft. in height, rarely more. It was introduced into cultivation by the late Mr. Justice Gillies and Mr. G. B. Owen about 1870, and is now comparatively common in gardens in the vicinity of Auckland. It is easy of cultivation, perfectly hardy in most parts of the North Island, will bear exposure to the strongest winds, and in good soil makes very rapid growth. A tree planted in my own garden attained a height of 20 ft. in less than ten years, with a spreading crown of branches 16 ft. in diameter, and with a trunk 24 in. in circumference at the base. Many of the leaves (including the petiole) were quite 2 ft. 6 in. in length.

New Zealand is the southern limit of *Meryta*, which is otherwise a purely Melanesian and Polynesian genus. Its main home appears to be in New Caledonia, from whence no less than eleven species have been described. Two are known from Norfolk Island, one from Samoa and the Tongan Islands, one from Rarotonga, two or three from the Society Islands, one from the Caroline Islands, and one from New Guinea.

PLATE 73. *Meryta Sinclairii*, drawn from specimens cultivated at Remuera, Auckland, showing leaf and male and female inflorescence. Fig. 1, male flowers ($\times 4$); 2 and 3, front and back view of anthers; 4, female flowers ($\times 4$); 5 and 6, transverse and longitudinal sections of ovary ($\times 4$); 7 and 8, longitudinal and transverse sections of fruit ($\times 3$); 9, longitudinal section of seed ($\times 6$); 10, embryo ($\times 10$).



M. Smith del.
J. N. Pritch lith.

West, Newman imp.

PSEUDOPANAX DISCOLOR, Harms.

PLATE 74.—PSEUDOPANAX DISCOLOR.

FAMILY ARALIACEÆ.]

[GENUS PSEUDOPANAX, C. KOCH.]

Pseudopanax discolor, Harms in *Pflanzeur*, t. iii, abt. 8, p. 46; *Cheesem. Man. N.Z. Fl.* 233.

For the discovery of this fine plant we are indebted to Mr. T. Kirk, who in November, 1867, collected it on the Great Barrier Island, where it is exceedingly abundant, ranging from sea-level to the tops of the highest hills; altitude 2,400 ft. It was referred by Mr. Kirk to *Panax Sinclairii*, which is in reality a very different species, and was mentioned under that name in his "Botany of the Great Barrier Island," published in the first volume of the "Transactions of the New Zealand Institute" (p. 144); but in 1870 he corrected the mistake, and described it as a new species under the name of *Panax discolor*. In the meantime he had also observed the plant on the Little Barrier Island; at Whangaroa (which appears to be its northern limit); at Omaha; and on the dividing range of the Cape Colville Peninsula, where it extends from Cape Colville as far south as Tairua. In all these localities it is abundant; but no additional stations have been recorded of late years.

Although originally placed in the genus *Panax* by Kirk, and retained in it in his "Students' Flora," the plant really falls into Koch's genus *Pseudopanax*, which differs from *Panax* in the 5-celled ovary and 5 styles, the latter being very short and connate into a minute cone or column. It was therefore correctly transferred to that genus by Harms in Engler and Prantl's "Pflanzenfamilien." At the same time, it may be mentioned that *Pseudopanax* as at present constituted contains two very different sets of species—one comprising *P. discolor* and the allied *P. Lessonii* and *P. Gilliesii*; the other including the species with strongly marked heteromorphous foliage, as *P. crassifolium*, *P. ferox*, and *P. chathamicum*. These two divisions appear to me to deserve the rank of distinct genera.

Pseudopanax discolor forms a handsome shrub 6 ft. to 15 ft. high, and is remarkable for its peculiar bronzy or yellow-green foliage. Its nearest ally, as remarked above, is undoubtedly *P. Lessonii*; but that species is larger and much more robust, with a very different habit of growth, and has dark-green coriaceous foliage, the leaflets being entire or sinuate-serrate, and almost veinless. In *P. discolor* the leaflets are thin, distinctly veined, and sharply and coarsely serrate. It does well in cultivation, but is of slow growth.

PLATE 74. *Pseudopanax discolor*, drawn from specimens collected on the Little Barrier Island by Miss Shakespear and myself. Fig. 1, flower-bud ($\times 4$); 2, male flower ($\times 4$); 3, male flower, with petals and stamens removed ($\times 4$); 4, stamen ($\times 6$); 5, female flower ($\times 4$); 6, the same with the petals, &c., removed ($\times 6$); 7, section of ovary ($\times 6$); 8, ripe fruit ($\times 3$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

PSEUDOPANAX CHATHAMICUM, T. Kirk.

PLATE 75.—PSEUDOPANAX CHATHAMICUM.

FAMILY ARALIACEÆ.]

[GENUS PSEUDOPANAX, C. KOCH.

Pseudopanax chathamicum, T. Kirk, *Students' Fl.* 223; *Cheesem. Man. N.Z. Fl.* 236.

Pseudopanax chathamicum was one of the first plants obtained on the Chatham Islands, for it was among those collected by Dieffenbach, the naturalist to the New Zealand Company, who visited the group in 1840. His specimens were probably imperfect, for otherwise Sir J. D. Hooker, who examined them while engaged in the preparation of the "Flora Novæ Zelandiæ," would never have referred them to the common New Zealand *P. crassifolium*. It was also collected by Mr. H. H. Travers, who explored the group in 1863; but apparently a fragment only of the plant was brought back. In Mr. Travers's second visit, made in 1871, a more complete suite of specimens was obtained; for Mr. Buchanan, who prepared a report on Mr. Travers's collection which was published in the *Trans. N.Z. Inst.* (vol. vii, p. 333), explicitly says that the Chatham Islands plant differed from the New Zealand form in the leaves of the young plant never being deflexed at any period of growth. In 1891 Mr. J. D. Enys paid a hurried visit to the group, and on his return gave a series of specimens of the plant to Mr. Kirk and myself, at the same time stating his conviction that it was specifically distinct from *P. crassifolium*. Shortly afterwards Mr. F. A. D. Cox succeeded in supplying Mr. Kirk with a fairly complete set of specimens, in all stages of growth, and the plant was accordingly described in the "Students' Flora" under its present name.

As already stated, the chief differences between *P. chathamicum* and *P. crassifolium* lie in the foliage of the young plants. Both *P. crassifolium* and its near ally *P. ferox* have a juvenile stage in which the leaves are very long, narrow-linear, and conspicuously deflexed. As the plant approaches maturity these linear deflexed leaves gradually become shorter, broader, and more erect; eventually passing into the comparatively short linear-oblong leaves of the adult. In *P. chathamicum*, on the contrary, the leaves of the juvenile stage are never much longer than those of the adult, nor much narrower, and are never deflexed. The leaves of the mature plant are also larger and broader than in *P. crassifolium*, and the fruit is much larger. These differences are quite sufficient to prove the distinct nature of the species.

Pseudopanax chathamicum appears to be generally distributed in the wooded portions of the Chatham Islands. Dr. Cockayne, in his paper on the "Plant Covering of the Chatham Islands" (*Trans. N.Z. Inst.* xxxiv (1902), 243 *et seq.*) mentions it as an abundant factor in the ordinary lowland forest, in the forest of the tableland, and in the somewhat different association found on limestone soils. In the lowland forest he classes it as seventh in the order of most frequent occurrence, the more abundant plants being (1) *Corynocarpus lævigata*, (2) *Olearia Traversii*, (3) *Coprosma chathamica*, (4) *Hymenanthera chathamica*, (5) *Myrsine chathamica*, and (6) *Corokia macrocarpa*. On calcareous soils the proportion of frequency is much higher (if I correctly interpret his remarks), the *Pseudopanax* taking the third place.

For an account of the early development of the seedlings of *P. chathamicum*, together with some remarks on its life-history, reference should be made to Dr. Cockayne's paper in *Trans. N.Z. Inst.* xxxii (1900), 88.

PLATE 75. *Pseudopanax chathamicum*, drawn from specimens supplied by Mr. F. A. D. Cox, of Whangamarino, Chatham Islands. Fig. 1, male flower ($\times 4$); 2 and 3, front and back view of anthers ($\times 8$); 4 and 5, female (or hermaphrodite?) flowers ($\times 4$); 6 and 7, longitudinal and transverse sections of ovary ($\times 6$); 8, longitudinal section of fruit ($\times 4$); 9, embryo ($\times 12$).



M. Smith del.
J.N. Petch lith.

West, Newman imp.

COROKIA BUDDLEOIDES, A. Cunn.

PLATE 76.—COROKIA BUDDLEOIDES.

FAMILY CORNACEÆ.]

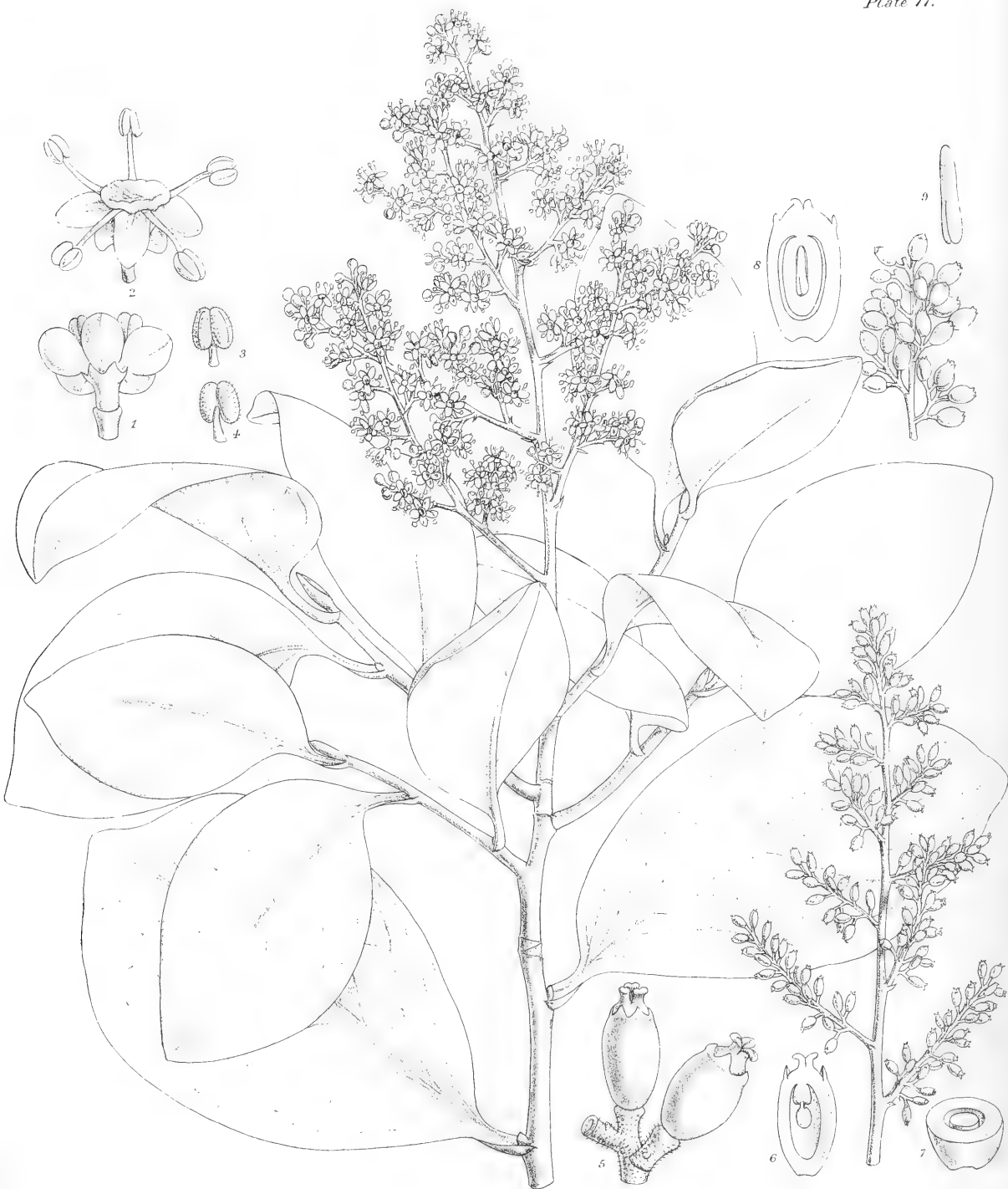
[GENUS COROKIA, A. CUNN.]

Corokia buddleoides, A. Cunn. *Precur.* n. 579; *Cheesem. Man. N.Z. Fl.* 237.

The subject of this plate was first collected by that enthusiastic botanist and explorer Allan Cunningham in the Bay of Islands district in the year 1826. Recognizing that it constituted a new genus, Cunningham gave it the name of *Corokia*, which is an adaptation of its Maori name korokio, or more correctly korokio-taranga; and it was published under that title in his "Precursor," issued in the years 1838-39. Cunningham attributed to his plant diœcious flowers and white petals, both of which statements are erroneous, the flowers being always perfect, and their colour yellow. The plant was collected by Mr. Colenso shortly after his arrival in the colony, and an excellent drawing, prepared from specimens forwarded by him, was published in the "Icones Plantarum" in the year 1843. Since then it has been observed by all botanists who have examined the vegetation of the northern portion of the North Island; in fact, it is common in forests from Kaitaia and Mangonui southwards to the Bay of Plenty, and probably to the East Cape, the most southern locality from whence I have seen specimens being inland from Opotiki. It is most plentiful at a little elevation above the sea, and was noted by Mr. Kirk on the summit of Mount Tarawera, prior to the eruption of 1886, at an altitude of 3,400 ft.

Corokia buddleoides is a handsome much-branched slender shrub 10 ft. or 12 ft. in height. The pale-green leaves, with their silvery-white under-surface, and the bright-yellow starlike flowers, render it an attractive plant, and it is somewhat curious that it has not found its way into gardens in the northern portion of the Dominion. It is easy of cultivation, of quick growth, and comes into bloom while comparatively young. It might well be planted in the place of many far less suitable exotics.

PLATE 76. *Corokia buddleoides*, drawn from specimens collected on the Waitakerei Ranges, near Auckland. Fig. 1, unexpanded flower ($\times 3$); 2, expanded flower ($\times 3$); 3, peltate hair (enlarged); 4, section of calyx and ovary ($\times 3$); 5, portion of corolla laid open, showing the scales at the base of the petals ($\times 5$); 6 and 7, front and back view of anther ($\times 8$); 8, scale ($\times 10$); 9, ripe fruit ($\times 2$); 10, longitudinal section of fruit ($\times 2$).



M. Smith del.
J. N. Fitch lith.

GRISELINIA LUCIDA, Forst.

West, Newman. imp.

PLATE 77.—GRISELINIA LUCIDA.

FAMILY CORNACEÆ.]

[GENUS GRISELINIA, FORST.

Griselinia lucida, Forst. *Prodr.* n. 401; *Cheesem. Man. N.Z. Fl.* 238.

The first specimens of this handsome tree were obtained in 1769 by Banks and Solander at Tolaga Bay during Cook's first voyage. Later on they also gathered it at "Opuragi" (Mercury Bay) and "Totaranui" (Queen Charlotte Sound). Dr. Solander, in his manuscript "*Primitiæ Floræ Novæ Zelandiæ*," recognized that it constituted a new genus, and proposed the name of *Lissophyllum lucidum*; but as his names were never actually published they have no standing in systematic botany. The two Forsters, who also collected the plant in Queen Charlotte Sound during Cook's second voyage, published it under the name of *Scopolia lucida*; but, as this proved to be invalidated by the earlier *Scopolia* of Jacquin, a genus of *Solanaceæ*, George Forster substituted *Griselinia* for it, a name which has received general acceptance.

Griselinia lucida has a wide range, being found in lowland forests from the North Cape to the Bluff, but is much more plentiful in the North Island than in the South, where its place is largely taken by the allied *G. littoralis*. It is usually epiphytic or rupestral, and is often found growing amongst the immense masses of *Astelia* and other epiphytes which clothe the spreading branches of the rata (*Metrosideros robusta*). In such situations it does not attain any great height, but its leaves are often unusually large, sometimes exceeding 8 in. in length. It reaches its greatest stature when growing among or on rocks, or on well-drained rocky soil, where specimens can be found 25 ft. in height or even more, with a trunk 18 in. to 24 in. in diameter. The finest rupestral specimens I have observed were growing among huge masses of crystalline limestone at Whangarei. It is a common plant on the basaltic lava-streams of the Auckland Isthmus, and is particularly frequent on Rangitoto Island, where flowering specimens can be seen of all sizes, from 3 ft. upwards. I cannot agree, however, with Mr. Kirk in considering that it shows any unusual luxuriance of foliage in that locality, or that the flowers are "of deeper and brighter tints than are produced under ordinary conditions" (see *Trans. N.Z. Inst.* xi (1879), 450).

Griselinia lucida is one of the New Zealand trees which ought to be commonly cultivated in gardens and shrubberies. It is easy of cultivation, and will grow in any ordinary soil; it stands exposure to the strongest winds, and is of rapid growth, while its pale yellow-green smooth and glossy foliage is most attractive. These remarks also apply to the allied *G. littoralis*, which reaches a greater size, but has smaller foliage and a more compact habit.

PLATE 77. *Griselinia lucida*, male, female, and fruit, drawn from specimens gathered on the lava-streams at Mount Wellington, near Auckland. Fig. 1, flower-bud of male flower ($\times 6$); 2, fully expanded male flower ($\times 6$); 3 and 4, front and back view of anthers ($\times 8$); 5, female flowers ($\times 6$); 6, section of same, showing the pendulous ovule ($\times 6$); 7, transverse section of ovary ($\times 6$); 8, longitudinal section of fruit ($\times 4$); 9, embryo ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

ALSEUOSMIA MACROPHYLLA, A. Cunn.

PLATE 78.—ALSEUOSMIA MACROPHYLLA.

FAMILY CAPRIFOLIACEÆ.]

[GENUS ALSEUOSMIA, A. CUNN.]

Alseuosmia macrophylla. A. Cunn. *Proc.* n. 491; *Cheesem. Man. N.Z. Fl.* 210.

Alseuosmia macrophylla, one of the most beautiful shrubby plants in the New Zealand flora, was originally discovered by Allan Cunningham in forests at Hokianga in the early part of October, 1826. The plant was in full bloom at the time, and the delicious fragrance of its flowers must have made no small impression on Cunningham, for when he came to describe the genus he gave it the name of *Alseuosmia*, from *αἶθος*, a grove, and *εὐοσμία*, a sweet smell. His biographer, Mr. Heward, says, "its elegant flowers adorned the woods, and its delicious odours filled the surrounding atmosphere with fragrance." That this statement is not overdrawn, all will admit who have passed through any forest in the northern part of New Zealand at the time when *Alseuosmia* is in full flower.

Since its original discovery *Alseuosmia macrophylla* has been observed by all botanists who have examined the vegetation of the northern part of New Zealand. In fact, to the north of a line drawn from the East Cape to Mount Egmont it is almost universally present in forests of any size, often forming a considerable proportion of the undergrowth. In kauri forests it is particularly abundant, usually associated with such species as *Phebalium nudum*, *Coprosma lucida*, *Senecio Kirkii*, *Dracophyllum latifolium*, *Astelia trinervia*, *Gahnia xanthocarpa*, &c. It is most plentiful between 500 ft. and 1,500 ft. elevation, but frequently descends to sea-level, and I have seen it at elevations of over 3,000 ft. South of the East Cape and Taranaki it is rare and local; but it nevertheless crosses Cook Strait, and has been found in a few scattered localities in Marlborough, north-west Nelson, and northern Westland.

The flowers of *Alseuosmia* vary much in colour. In many localities they are almost a full crimson, with the inside of the throat slightly paler, and this is certainly the most handsome form. In other cases the flowers are much paler, being a pinkish-cream with lines of darker pink; and I have seen specimens in which they were a pure cream-colour without lines or other markings. The beauty of the flowers and their delicious fragrance certainly marks off the plant as one which should be cultivated in gardens; but, unfortunately, it has the reputation of being difficult to establish, and still more difficult to keep. Probably it would succeed best if kept in a bush-house, with the same treatment as that given to many ferns.

The genus *Alseuosmia* is confined to New Zealand. It differs from all other members of the *Cuprifoliaceæ* in the alternate leaves, and cannot be said to have any close ally, although possibly as near to *Lonicera* as to any other genus. Of the four species which are generally admitted, *A. macrophylla* is at once distinguished by its large leaves and flowers. The three others present a very varied series of forms, all of which are exceedingly difficult of discrimination. No doubt some botanists will prefer to call these "species"; and this was the view taken by Cunningham, who described no less than seven, to which Colenso has added two others. Similar views are certain to be asserted for many other genera of New Zealand plants, and their acceptance or rejection will involve very careful examination of the facts of each case.

PLATE 78. *Alseuosmia macrophylla*, drawn from specimens collected on the Patetere Plateau, Upper Thames. Fig. 1, calyx and pistil ($\times 2$); 2, longitudinal section of calyx and ovary ($\times 4$); 3, corolla laid open ($\times 2$); 4 and 5, front and back view of anthers ($\times 4$); 6, transverse section of ovary ($\times 4$).



M. S. B. in the
N. F. von Lüt.

West, Newman imp.

COPROSMA LUCIDA, Forst.

PLATE 79.—COPROSMA LUCIDA.

FAMILY RUBIACEÆ.]

[GENUS COPROSMA, FORST.

Coprosma lucida, Forst. Prodr. n. 137; Cheesem. Man. N.Z. Fl. 246.

The genus *Coprosma* is one of the most characteristic of those included in the New Zealand flora. Its species are found in all soils and situations, and everywhere form a prominent feature of the vegetation, from the sea-coast to an altitude of at least 6,500 ft., and from the Kermadec Islands in the north to Campbell Island and Macquarie Island in the south. There are no districts in the Dominion in which some species of *Coprosma* are not abundant, and in many localities they form associations which give a distinct facies to the vegetation. Under such circumstances the first explorers of the botany of New Zealand could not fail to become acquainted with the genus, and it is not surprising to learn that one species at least, the widely distributed *C. acaesosa*, was gathered by Banks and Solander on the day when they first landed in New Zealand—8th October, 1769. Later on during Cook's first voyage other species were collected in various localities, and among them the subject of the present plate. Dr. Solander, in his unpublished work on the flora of New Zealand, included all these in a genus which he called *Pelaphia*, but this is not a valid name, as it was never actually published.

The name *Coprosma* was first used by the two Forsters in their "Characteres Generum Plantarum," published in 1776. In it two species were admitted—the well-known *C. fetidissima* (see Plate 83), and the subject of the present plate, to which they gave the name of *C. lucida*. At the present time over sixty species are known, of which forty are natives of New Zealand. Outside this country the genus extends to Australia and Tasmania, and northwards to New Guinea and Borneo. It also stretches through Polynesia as far north as the Sandwich Islands, and eastwards to Juan Fernandez. Whilst its centre of distribution is in New Zealand itself, its Polynesian and Malayan extension is a matter of significance to those interested in the affinities and origin of the New Zealand flora.

Coprosma lucida is a well-known and abundant plant, found throughout the whole of the Dominion, from the North Cape to Stewart Island, and ranging from sea-level to considerably over 3,000 ft. Like most species of the genus, it is extremely variable. When growing in the open it usually forms a compact round-topped shrub, sometimes only a few feet in height; the leaves are very thick and coriaceous, conspicuously obovate, and thus decidedly obtuse. But when found in the forest it is taller, much more sparingly branched; and the leaves are less coriaceous and of a darker green, and are often subacute. Comparing it with the other species, its nearest ally is undoubtedly *C. grandifolia*, with which it agrees in its lax well-developed inflorescence. But *C. grandifolia* has much larger, thinner, and more membranous leaves, and has a much more open habit of growth. *C. robusta*, which is often mistaken for it when out of flower, has darker-green more elliptic always acute leaves, and the inflorescence is much less developed, the flowers being congested into dense axillary glomerules. All the other large-leaved species are amply distinct.

PLATE 79. *Coprosma lucida*, male, female, and fruit, drawn from specimens collected in the vicinity of Auckland. Fig. 1, portion of under-surface of leaf, showing the "domatia" in the axils made by the main veins with the midrib (enlarged); 2, bract ($\times 4$); 3, unexpanded bud of male flower ($\times 4$); 4, fully expanded male flower ($\times 4$); 5 and 6, front and back view of anthers ($\times 8$); 7, female flower ($\times 4$); 8, section of ovary ($\times 4$); 9, section of fruit ($\times 2$); 10, pyrene from fruit ($\times 2$); 11, section of pyrene ($\times 2$); 12, seed ($\times 3$); 13, section of seed ($\times 3$); 14, embryo ($\times 3$).



M. Smith del
J.N. Fitch lith

West, Newman imp.

COPROSMA SERRULATA, Hook. f.

PLATE 80.—COPROSMA SERRULATA.

FAMILY RUBIACEÆ.]

[GENUS COPROSMA, FORST.

Coprosma serrulata, Hook. f. ex Buch. in Trans. N.Z. Inst. iii (1871), 212; Cheesem. Man. N.Z. Fl. 247.

C. serrulata was originally discovered by Mr. J. Buchanan on Mount Ida, in Central Otago, in the year 1865. Four years later it was collected by Sir James Hector on the mountains of north-west Nelson; and since then it has been observed in many localities along the chain of the Southern Alps, especially within the influence of the heavy westerly rainfall. Sir Julius von Haast and Mr. J. B. Armstrong gathered it in several places on the mountains of Canterbury; I have seen it in at least a score of stations in north-west Nelson and Canterbury; Mr. Townsend found it plentiful on the western slopes of the coastal ranges near Westport; Mr. Petrie reports it as by no means rare on the mountains of Central and Western Otago; and Mr. Reischek gathered it on the mountains overlooking Dusky Sound. Its altitudinal range is from 2,000 ft. to 4,500 ft.

C. serrulata and in a smaller degree *C. retusa* are the only species of the genus in which the leaves are minutely serrulate. But the serrulations are more apparent than real, for on examination it will be found that they do not extend beyond the thickened and cartilaginous margin of the leaf. The young leaves of *C. robusta* are occasionally minutely incised, but the character does not persist in the mature foliage.

The serrulate leaves render the species an easy one to distinguish, but it has other peculiarities of a marked character. The bark of the stems and old branches is loose, white, and papery, and can be detached in flakes of considerable size. The stipules are unusually large, and often form swollen connate sheaths surrounding the branch, as shown in the accompanying plate, the mouth of the sheath being toothed and ciliate. The whole plant is seldom more than 3 ft. or 4 ft. in height, and sometimes does not exceed 2 ft.; and the branches are few and straggling. Although it technically falls into the same group of species as *C. lucida* and *C. robusta*, it differs widely in habit and general appearance, and must be regarded as one of the most distinct members of the genus.

PLATE 80. *Coprosma serrulata*, male, female, and fruit, drawn from specimens collected in the Mount Cook district, at an altitude of 4,000 ft. Fig. 1, base of leaf and stipule (enlarged); 2, male flowers ($\times 3$); 3, female flower ($\times 3$); 4, the same with the corolla removed ($\times 5$); 5, female corolla laid open, showing the barren stamens ($\times 5$); 6, stamen ($\times 8$); 7, longitudinal section of fruit ($\times 2$); 8 and 9, longitudinal and transverse sections of pyrene ($\times 4$).



M. Smith del
J.N. Fitch lith

West, Newman imp.

COPROSMA AREOLATA, Cheesem.

PLATE 81.—COPROSMA AREOLATA.

FAMILY RUBIACEÆ.]

[GENUS COPROSMA, FORST.

Coprosma areolata, Cheesem. in *Trans. N.Z. Inst.* xviii (1886), 315; *Cheesem. Man. N.Z. Fl.* 252.

This was first recognized as a distinct species by myself; and was described under its present name in a paper read before the Auckland Institute in 1885, and published in the "Transactions of the New Zealand Institute" for the same year. At the same time, however, I was informed by Mr. N. E. Brown that specimens of old date clearly referable to it existed in the Kew Herbarium, and were confused with *C. rotundifolia* by Sir J. D. Hooker, both in the "Flora Novæ Zelandiæ" and in the "Handbook." It is not easy to understand how this could be done, seeing that *C. areolata* differs conspicuously from *C. rotundifolia* in the paler colour, fastigate and not divaricating mode of growth, much smaller and paler acute leaves, and rather larger black drupes. It is much nearer to *C. tenuicaulis*, which is chiefly separated by its smaller size, spreading branches, dark-coloured bark, less pubescent leaves and branchlets, and smaller and more coriaceous leaves.

C. areolata is a widely distributed species, being found in lowland forests throughout the greater part of the Dominion, from Mangonui and Kaitaia southwards to Stewart Island. It is perhaps most abundant in the swampy forests which fringe the banks of many of the larger rivers, as the Northern Wairoa, Thames, Waikato, &c. In such situations its tall fastigate mode of growth and pale bark and foliage offer a striking contrast to other species of the same genus often found in close association with it; as, for instance, *C. rotundifolia*, *C. tenuicaulis*, *C. rigida*, *C. parviflora*, &c. All these have widely divaricating branches, and thus present an altogether different aspect.

In most of the lowland species of *Coprosma* the flowering season is in early spring—that is, from the middle of August to the middle of October, according to the species. The fruit matures during the following autumn, the months of April and May being the time when perfectly ripe fruit can be obtained in the greater number of the species. *C. areolata*, however, is remarkable for departing from this rule. It flowers at the usual time, which in the North Island is the month of September or beginning of October, but its fruit is not mature until the December of the following year, or not until after the lapse of fifteen months. On the same tree can be seen perfectly ripe fruit and immature berries which will not be ripe until the following December. It is difficult to imagine what advantage it can be to the species to have the development of its fruit delayed to such an extent.

PLATE 81. *Coprosma areolata*, male, female, and fruit, drawn from specimens collected at Hunua, near Auckland. Fig. 1, pair of leaves ($\times 2$); 2, male flowers ($\times 4$); 3, female flowers ($\times 4$); 4, longitudinal sections of female flower ($\times 6$); 5, fruit ($\times 4$); 6, section of fruit ($\times 4$); 7, section of pyrene ($\times 4$); 8, section of seed ($\times 4$).



M. Smith del.
J.M. Fitch hth.

West, Newman imp.

COPROSMA RHAMNOIDES, A. Cunn. var. DIVARICATA, Cheesem.

PLATE 82.—COPROSMA RHAMNOIDES.

FAMILY RUBIACEÆ.]

[GENUS COPROSMA, FORST.

Coprosma rhamnoides, A. Cunn. Precur. n. 474 ; Cheesem. Man. N.Z. Fl. 252.

The type of *Coprosma rhamnoides* was collected in 1834 by Richard Cunningham on the banks of the Kerikeri River, Bay of Islands, a locality in which it still exists. It was published by Allan Cunningham in his well-known "Precursor," but his description is by no means good ; and I should not have felt at all sure of the identity of the plant but for the kind assistance of Mr. N. E. Brown, of the Kew Herbarium, who many years ago compared sets of my *Coprosmas* with Cunningham's types and with other specimens preserved in the Kew Herbarium. In 1826 Allan Cunningham gathered a *Coprosma* in "dry woods at Whangaroa" to which he gave the name of *C. divaricata*. Unfortunately, when Sir J. D. Hooker undertook the publication of his "Flora Novæ Zelandiæ" he incorrectly applied this name to a group of plants now known as *C. crassifolia*, *C. rigida*, and *C. rubra* ; and it was not until I undertook my revision of the genus (Trans. N.Z. Inst. xix (1887), 216) that the error was discovered. Mr. Brown then ascertained that Cunningham's type of *C. divaricata* had nothing in common with Hooker's plants, but agreed so closely with *C. rhamnoides* that the two could only be separated as varieties. As both names were published at one time in the "Precursor," *C. rhamnoides* as No. 474, and *C. divaricata* as No. 476, I took the first name for the joint species, distinguishing the second plant as var. *divaricata*. It is this variety which is figured in the accompanying plate.

C. rhamnoides, taking the species in its fullest sense, has a wide distribution in the Dominion, ranging from the North Cape to Stewart Island, and from sea-level to fully 3,000 ft. Its distinguishing characters lie in the spreading habit, with the branches often much interlaced, the densely pubescent twigs, orbicular to ovate or trowel-shaped leaves, small flowers, and red globose fruit. In a living state there is little difficulty in separating it from its nearest allies. *C. areolata* is at once distinguished by its fastigiate outline, thin pale leaves, and black fruit. *C. tenuicaulis* also has black fruit, smaller and more coriaceous leaves, and less-pubescent purplish-brown twigs. *C. parviflora* has more pubescent twigs, narrower and usually more coriaceous obovate or linear-obovate leaves, and bluish or bluish-black fruit.

The typical form of the species, with rounded obtuse leaves, is often quite a small shrub (sometimes only 2 ft. to 3 ft. high) with a stiff rigid habit and decidedly coriaceous leaves. But there are other forms in which the branches are longer and more slender, with thinner and narrower subacute leaves. These states have been described as distinct species by Mr. Colenso, under the name of *C. concinna* and *C. orbiculata*. The variety *divaricata* also runs into numerous forms, in which the leaves vary from nearly orbicular to ovate, trowel-shaped, or even oblong. One common subvariety is remarkable for having narrow lanceolate or linear leaves mixed with those of the ordinary form, these leaves being most plentiful on the youngest branches. To this form the name of *C. heterophylla* has been applied by Mr. Colenso, but it cannot be looked upon as more than a trivial variety.

PLATE 82. *Coprosma rhamnoides* var. *divaricata*, male, female, and fruit, drawn from specimens collected at Chelsea, near Auckland. Figs. 1, 2, and 3, leaves of different shapes taken from the same branch ($\times 4$) ; 4, male flowers ($\times 5$) ; 5, female flowers ($\times 5$) ; 6, longitudinal section of ovary ($\times 8$) ; 7, fruit (should be more globose) ($\times 4$) ; 8 and 9, pyrenes ($\times 4$) ; 10, section of pyrene ($\times 5$).



M. Smith del.
J. N. Fitch lith.

West Newman imp

COPROSMA FOETIDISSIMA, Forst.

PLATE 83.—COPROSMA FÆTIDISSIMA.

FAMILY RUBIACEÆ.]

[GENUS COPROSMA, FORST.

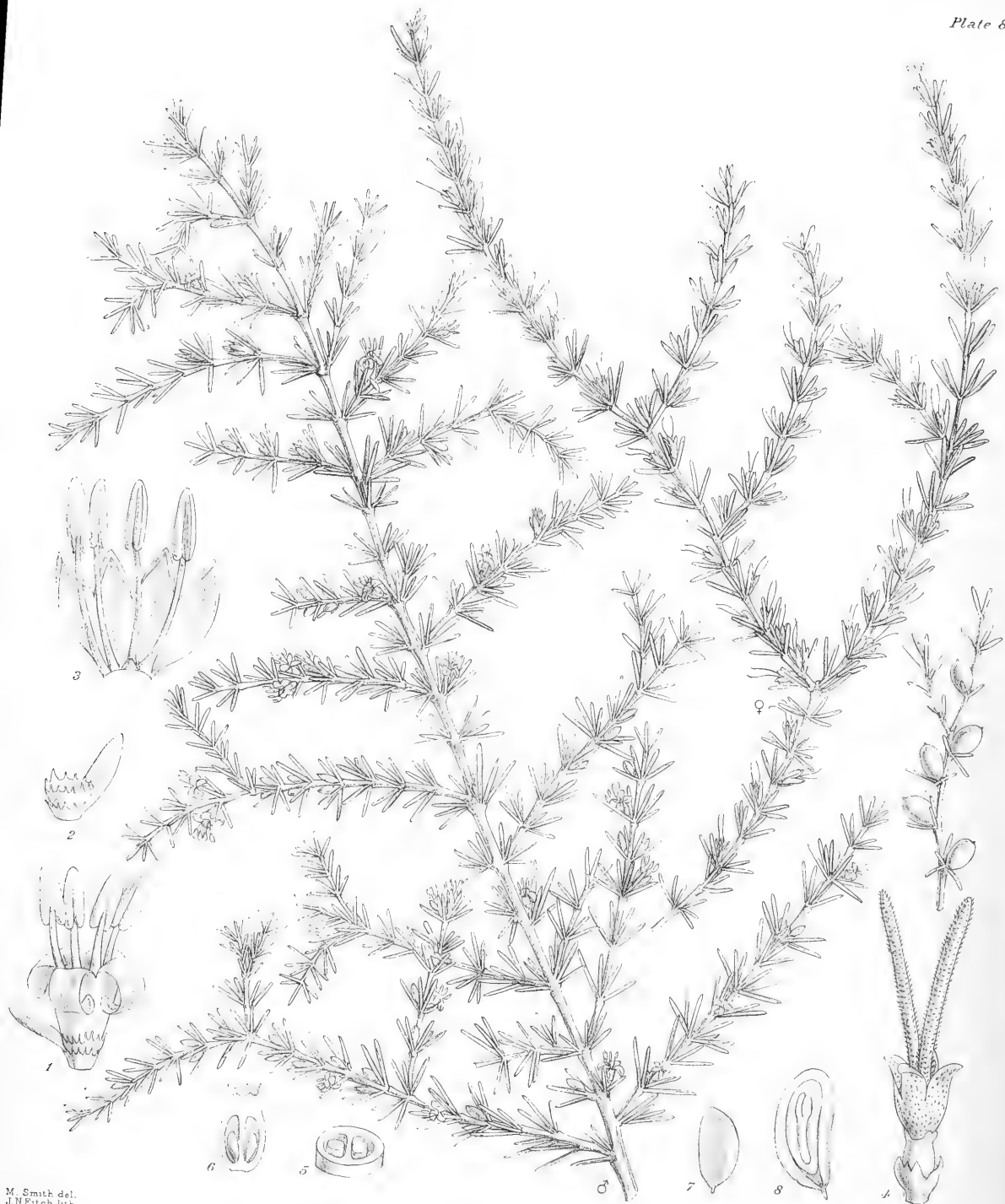
Coprosma fœtidissima, Forst. Char. Gen. 135; Cheesem. Man. N.Z. Fl. 259.

This well-known species was one of those collected by the two Forsters in Queen Charlotte Sound in the year 1773 during Cook's second visit to New Zealand. Its discoverers recognized the distinct nature of the plant, and within a year after the return of the expedition it was described in their "Characteres Generum Plantarum" as the type of a genus to which they gave the very expressive name of *Coprosma*. Curiously enough, it was not again collected until 1840, when Sir J. D. Hooker observed it in considerable abundance in the Auckland Islands. In the following year, however, it was gathered by Mr. Colenso in the East Cape district; and since then has been noticed by all those who have paid any serious attention to the flora of New Zealand. Its northern limit is on Moehau Mountain, in the Cape Colville Peninsula, from whence it stretches southwards in hilly or mountain forests to Cook Strait. In the South Island it is abundant in most forest districts, often forming a considerable proportion of the undergrowth, and this also is the case on Stewart Island.

Coprosma fœtidissima usually forms a slender sparingly branched shrub 6 ft. to 15 ft. in height; but occasionally it attains a greater size, and on the Auckland Islands, according to Hooker, it sometimes reaches a height of 20 ft., with a trunk $1\frac{1}{2}$ ft. in diameter. It is chiefly remarkable for the horribly disgusting odour which it gives off when bruised or while drying. Sir J. D. Hooker, in the "Flora Antarctica," states that when in the Auckland Islands he "brought on board the 'Erebus' specimens of this with other plants, late one evening, and finding that there were more tender species, which took a considerable time to lay in paper, than I could well get through that night, I locked this *Coprosma* in a small close cabin until I should have leisure to press it, but before half an hour had elapsed the smell was intolerable and had pervaded the whole of the lower deck." Every one who has attempted to dry specimens of the plant will recognize that this account is not overdrawn.

The nearest ally of *C. fœtidissima* is undoubtedly *C. Colensoi*; but that is a much smaller plant, seldom more than 6 ft. in height, with very much smaller leaves, and with the flowers usually borne on short decurved peduncles. It also lacks the disagreeable smell of *C. fœtidissima*.

PLATE 83. *Coprosma fœtidissima*, male and female, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, male flower ($\times 3$); 2, female flower ($\times 3$); 3, longitudinal section of female flower, showing sterile stamens ($\times 3$); 4 and 5, front and back view of anthers ($\times 4$); 6, section of fruit ($\times 2$); 7, pyrene ($\times 3$); 8, section of pyrene ($\times 3$).



M. Smith del.
J. N. Fitch lith.

COPROSMA ACEROSA, A. Cunn.

West, Newman imp.

PLATE 84.—COPROSMA ACEROSA.

FAMILY RUBIACEÆ.]

[GENUS COPROSMA, FORST.

Coprosma acerosa, A. Cunn. *Precur.* n. 477; *Cheesem. Man. N.Z. Fl.* 257.

The sea-coast of New Zealand is often fringed for scores of miles by wide-spreading sand-dunes, which stretch inland for considerable distances, and sometimes reach a height of 500 ft. These dunes support a very peculiar and characteristic vegetation, so remarkably uniform throughout the entire length of the Dominion that many of the species abundant at the North Cape are equally plentiful at the Bluff. One of the most prominent and widely spread of these species is the subject of the present plate.

The discovery of *Coprosma acerosa* dates back to the first landing of Europeans on the shores of New Zealand during Cook's first voyage, for it was one of the species collected by Banks and Solander in Poverty Bay on the memorable 8th and 9th of October, 1769. It was fully described and figured by Dr. Solander in his manuscript "Flora of New Zealand" under the name of *Pelaphia acerosa*; but, as previously explained in this work, his names were never actually published, and thus have no standing in systematic botany. After Cook's departure the plant was not again observed until 1826, when the enthusiastic Allan Cunningham obtained it in Matauri Bay, a little to the south of Whangaroa Harbour. A few years later he published the species in his "Precursor," using Solander's specific name of *acerosa*, and Forster's generic title of *Coprosma*. Since then it has been proved to be abundant on all sand-dunes of any size, from the North Cape to Stewart Island.

Coprosma acerosa usually forms more or less dense carpets or cushions from 2 ft. to 6 ft. in diameter, and from 6 in. to 4 ft. in height. Its branches are long and flexuous, often much interlaced, and are covered with yellowish-green linear leaves, generally more or less closely appressed. The flowers are of the type usual in the small-leaved section of the genus, and need no description here; but the berry is often conspicuous from its pale sky-blue colour and comparatively large size, although the latter character is somewhat variable. As already stated, the species is abundant on sand-dunes. It has been pointed out by Dr. Cockayne, in his "Report on the Sand-dunes of New Zealand," that it is of considerable importance by detaining around it sand which would otherwise be blown inland by the wind. It thus acts as a "sand-collector"; and, if not buried by a too liberal supply of drifting sand, is of considerable value for fixing the surface of the dune, and thus assisting in its gradual reclamation.

In the above remarks I have had solely in mind the typical state of the species, which, so far as I know, is never found away from the sand-dunes of the coast, and which is easily recognized by its peculiar habit and yellow-green colour. But, as I first pointed out in my revision of the genus (*Trans. N.Z. Inst.* xix (1887), 245), there is another well-marked variety which is of common occurrence in certain inland stations, such as the stony river-valleys of the South Island and in the mountainous districts of the North Island. It can be distinguished by its dark-brown colour, fewer short stout and rigid branches, and shorter and more distant coriaceous leaves. The varietal name of *brunnea* was applied to it by Mr. Kirk in his "Students' Flora." More recently Dr. Cockayne has proposed to constitute it a separate species; but, I think, quite unnecessarily.

PLATE 84. *Coprosma acerosa*, male, female, and fruit, drawn from specimens collected on sand dunes near the Kaipara Harbour. Fig. 1, male flower ($\times 6$); 2, bracts and calyx ($\times 6$); 3, corolla laid open ($\times 6$); 4, female flower ($\times 6$); 5, transverse section of ovary ($\times 8$); 6, longitudinal section of ovary ($\times 8$); 7, pyrene ($\times 3$); 8, longitudinal section of pyrene ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

OLEARIA INSIGNIS, Hook. f.

PLATE 85.—OLEARIA INSIGNIS.

FAMILY COMPOSITÆ.]

[GENUS OLEARIA, MENCH.

Olearia insignis, Hook. f. *Fl. Nov. Zel.* ii, 331; *Cheesem. Man. N.Z. Fl.* 279.

New Zealand contains many handsome and remarkable shrubby Composites, but it may be doubted if any one of them is more deserving of notice than the subject of this plate. Its peculiar habit, the excessively thick and coriaceous leaves with their shining upper surface and dense coating of white tomentum beneath, the tall stout peduncles, each with its single bold head, and the large broad involucre with their many rows of scales, are prominent and noteworthy characters; while the general appearance of the plant is singularly attractive.

Olearia insignis was originally discovered by Sir David Monro in 1853 in rocky places on the banks of the Waihopai River, the principal tributary of the Wairau; and was shortly afterwards gathered in the Awatere Valley by Dr. Sinclair. Since then it has been found to be fairly plentiful in the eastern portion of the Marlborough Provincial District, from a little to the south of Blenheim to the Conway and Mason Rivers. It is essentially a plant of rocky cliffs and ledges, or of the debris which has fallen from them, and appears to be partial to calcareous soils. It has a wide range of altitude, and has been found from sea-level to 4,000 ft.

Few New Zealand plants are more easy of cultivation than *O. insignis*. It does well in any ordinary garden soil, and requires no special treatment whatever. A plant cultivated in my own garden flowered profusely each summer for a long succession of years, often producing during a single season more than a hundred large flower-heads from 2 in. to 3 in. in diameter, each flower-head lasting for several days. It was treated as an ordinary lawn-plant, and always attracted much attention.

As a species *O. insignis* is exceedingly distinct. Technically, it falls into the section *Eriotriche*, in which the hairs constituting the indumentum of the plant are neither stellate nor fixed by the middle, but form an intricate mass of dense wool. But neither in habit nor appearance does it agree with the other species constituting the section, most of which have small leaves and small flower-heads, while none has the broad involucre with many rows of bracts and the uniseriate pappus of perfectly equal hairs possessed by *O. insignis*.

PLATE 85. *Olearia insignis*, drawn from specimens collected in the Awatere Valley, Marlborough, by Mr. H. J. Matthews. Fig. 1, ray-floret ($\times 3$); 2, disc-floret ($\times 3$); 3, outer pappus-hair (enlarged); 4, inner pappus-hair (enlarged); 5, anthers ($\times 8$); 6, style-arms ($\times 8$); 7, young plant in flower, reduced from a photograph.



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

OLEARIA SEMIDENTATA, Decne.

PLATE 86.—OLEARIA SEMIDENTATA.

FAMILY COMPOSITÆ.]

[GENUS OLEARIA, MENCH.

Olearia semidentata, *Dene, ex Hook. f. Fl. Nov. Zel.* i, 115; *Cheesem. Man. N.Z. Fl.* 280.

Olearia semidentata, which is confined to the Chatham Islands, was first observed between the years 1836–39 during a hasty visit paid to the group by the French exploring-vessel “Venus”; and in 1841 a beautiful plate of it was prepared under the direction of the well-known botanist Decaisne. It was next gathered by Dr. Dieffenbach, the naturalist to the New Zealand Company, who visited the islands in 1841; and it was from his specimens that the descriptions given by Hooker in the “Flora” and the “Handbook” were prepared. In 1863 the Chatham Islands were botanically explored by Mr. H. H. Travers, when numerous specimens of the plant were obtained. Since then it has been gathered by all visitors to the group, and the main facts of its life-history have been fairly well ascertained.

According to Dr. Cockayne, whose memoir on the “Plant Covering of Chatham Islands” (*Trans. N.Z. Inst.* xxxiv (1902), 242–325) is a storehouse of information respecting the vegetation of the islands, *Olearia semidentata* is a dominant species in the peat bogs that occupy such a considerable proportion of the surface of the main island of the group; excepting always the very wet swamps, which have a vegetation mainly composed of *Sphagnum*. In the bogs that are firmer and drier the plants most commonly seen are *Lepyrodia Traversii*, *Olearia semidentata*, and *Dracophyllum scoparium* var. *paludosum*, forming an association to which Dr. Cockayne gives the name of the *Lepyrodia-Olearia* formation.

Olearia semidentata, when growing under favourable conditions, forms rounded bushes 2 ft. to 3 ft. in height and rather more in diameter. When in full bloom it is covered with numerous aster-like flower-heads, the ray-florets of which are purple and the disc-florets a deeper violet-purple. It is thus a very beautiful and striking plant, fully worthy of a place in colonial and European gardens. An excellent illustration of the appearance of the species in its natural home is given in the “Kew Bulletin” for 1910 (p. 122), prepared from a photograph taken by Captain Dorrien-Smith, who in 1909 paid a visit to the Chatham Islands for the special purpose of introducing the plant into cultivation in England.

The nearest ally of *O. semidentata* is undoubtedly *O. chathamica*, the subject of the following plate, which differs mainly in its more robust habit, broader and more coriaceous leaves, and larger flower-heads, the ray-florets of which are usually white, whereas they are almost invariably purple in *O. semidentata*.

PLATE 86. *Olearia semidentata*, drawn from specimens collected in the Chatham Islands by Mr. F. A. D. Cox. Fig. 1, bracts from the involucre ($\times 4$); 2, ray-floret ($\times 4$); 3, disc-floret ($\times 4$); 4, pappus-hairs ($\times 8$); 5, anthers ($\times 8$); 6, style-arms ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

OLEARIA CHATHAMICA, T. Kirk.

PLATE 87.—OLEARIA CHATHAMICA.

FAMILY COMPOSITÆ.]

[GENUS OLEARIA, MENCH.

Olearia chathamica, T. Kirk in *Trans. N.Z. Inst.* xxiii (1891), 444; *Cheesem. Man. N.Z. Fl.* 280.

This handsome plant was first observed during Mr. H. H. Travers's first visit to the Chatham Islands in the year 1863. The late Baron Mueller, who dealt with Mr. Travers's collections in his little book on the "Vegetation of the Chatham Islands," did not separate it as a species from *O. semidentata*, although he admitted (p. 22) that it differed in its "blunt-toothed larger leaves attenuated more distinctly into a broad petiole" and in the larger heads. Sir J. D. Hooker, in the Appendix to the "Handbook" (p. 731), referred it to *O. operina*, characterizing it as a "form with lax bracts on the scapes, thus connecting it with *O. angustifolia*." In 1871 Mr. Travers paid a second visit to the islands, when the plant was again collected. Mr. Buchanan, in his memoir on "The Flowering-plants and Ferns of the Chatham Islands" (*Trans. N.Z. Inst.* vii (1875), 332-41) treated it as a variety of *O. angustifolia*. It was not until the publication of Mr. Kirk's paper on the "Macrocephalous Olearias of New Zealand" (*l.c.*, xxiii (1891), 443) that the rank of a distinct species was given to it. Although closely allied to both *O. operina* and *O. angustifolia*, it is sufficiently distinct in its broader leaves, much more slender peduncles, and in the fewer linear bracts. Its differences from *O. semidentata* have already been pointed out under that species.

Dr. Cockayne, in his account of the vegetation of the Chatham Islands (*Trans. N.Z. Inst.* xxxiv (1902), 297-98) states that *Olearia chathamica* "is almost exclusively confined to the dryer ground just at the edge of the cliffs, in which places *O. semidentata* is not abundant. Here it forms dense thickets, unmixed for the most part with any other shrubs; or, if growing more in the open, each plant forms a large rounded bush. The branches radiate upwards and outwards from usually several short thick main stems, and are leafy only at their extremities for a distance of about 18 cm. or so. Their ultimate branches are covered with dense white pubescence. The leaves vary in shape, some being merely lanceolate, but others much broader." "There is at the present time a distinct zone of *O. chathamica* extending for a distance of 12 m. or more along the south cliffs of Chatham Islands, and following the dry ridges inland, but usually only for a short distance; and there are no traces of this formation elsewhere in the islands, except that an isolated plant or two have been found on his run by Mr. Cox. In the north of the islands *O. chathamica* is altogether absent."

As mentioned in my account of the previous plate, *O. chathamica* usually has white ray-florets. I am indebted to Mr. Cox, however, for specimens of a purple-flowered variety; and, according to Dr. Cockayne, a similar form was collected on the adjacent Pitt Island by Professor Dendy.

PLATE 87. *Olearia chathamica*, drawn from specimens collected in the Chatham Islands by Mr. F. A. D. Cox. Fig. 1, outer bracts of the involucre ($\times 4$); 2, inner bracts of the same ($\times 4$); 3, ray-floret ($\times 4$); 4, pappus-hairs ($\times 10$); 5, disc-floret ($\times 4$); 6, anther ($\times 10$); 7, style-arms ($\times 12$).



M. Smith del
J.N. Fitch lith

West, Newman imp.

OLEARIA NITIDA, Hook. f.

PLATE 88.—OLEARIA NITIDA.

FAMILY COMPOSITÆ.]

[GENUS OLEARIA, MENCH.

Olearia nitida, Hook. f. *Handb. N.Z. Fl.* 125; *Cheesem. Man. N.Z. Fl.* 285.

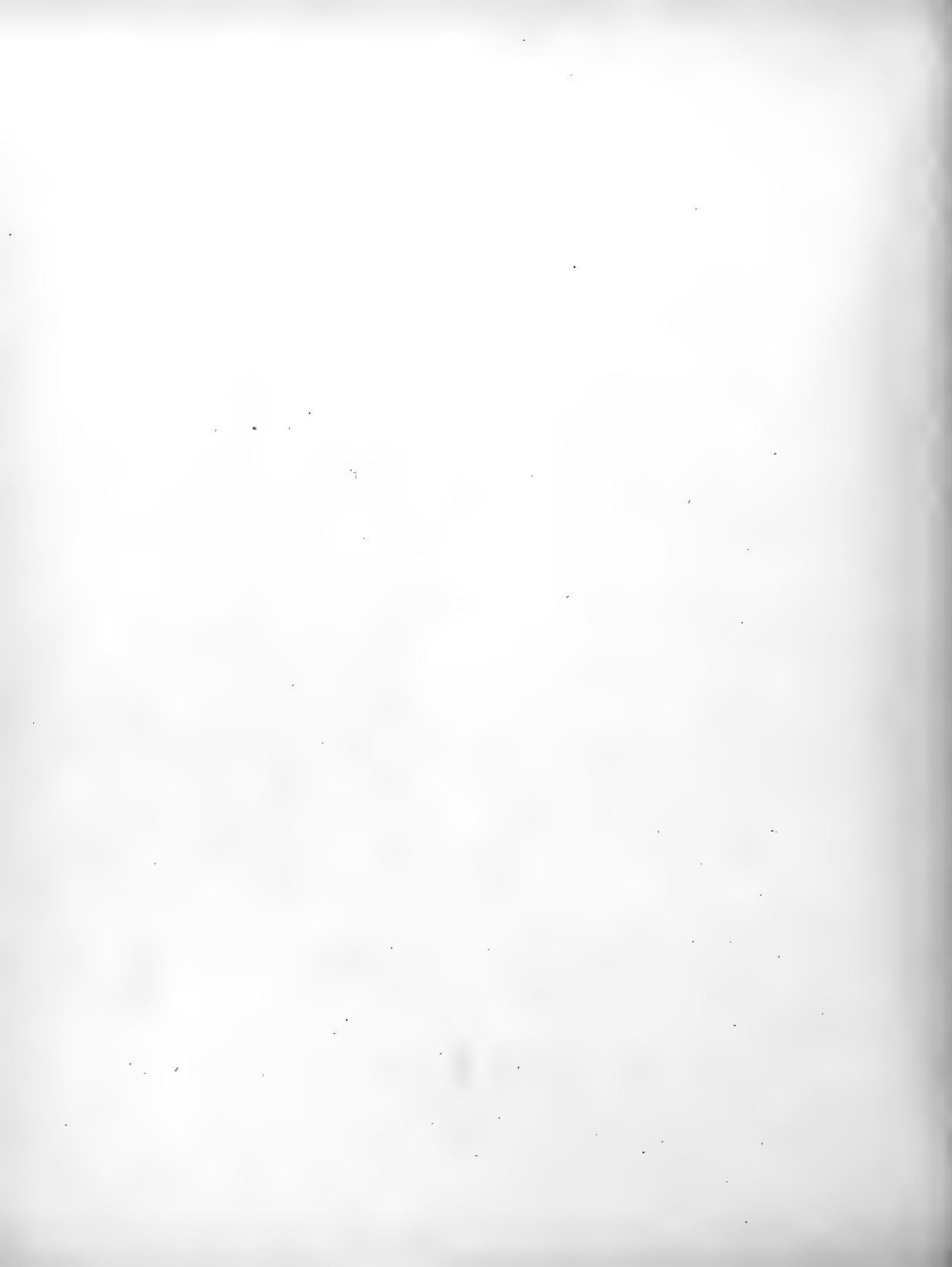
The subject of this plate was first noticed in the year 1773 during Cook's second voyage. In what locality it was observed is not precisely known, but it must have been either in Queen Charlotte Sound or in Dusky Sound—most probably the first. It was ultimately published by George Forster in his "Prodrum" under the name of *Solidago arborescens*, but the description is so short and scanty that without access to Forster's types it would have been impossible to fix the species. Fortunately, a set of Forster's plants exists in the Paris Museum of Natural History, and consequently A. Richard, in his "Flore de la Nouvelle Zélande," was able to prepare a satisfactory description of the species. In 1853 Sir J. D. Hooker transferred it to the genus *Eurybia*, at the same time changing the specific name to the more appropriate one of *nitida*. In those days the inviolability of the first specific name conferred upon a plant was not a generally accepted doctrine; and no doubt he was influenced by the fact that the name "*arborescens*" would be without meaning in a genus like *Eurybia*, which is altogether composed of trees or shrubs. At the same time, the present laws of botanical nomenclature leave no choice in the matter, and Forster's name will have to be replaced, however inappropriate it may now be.

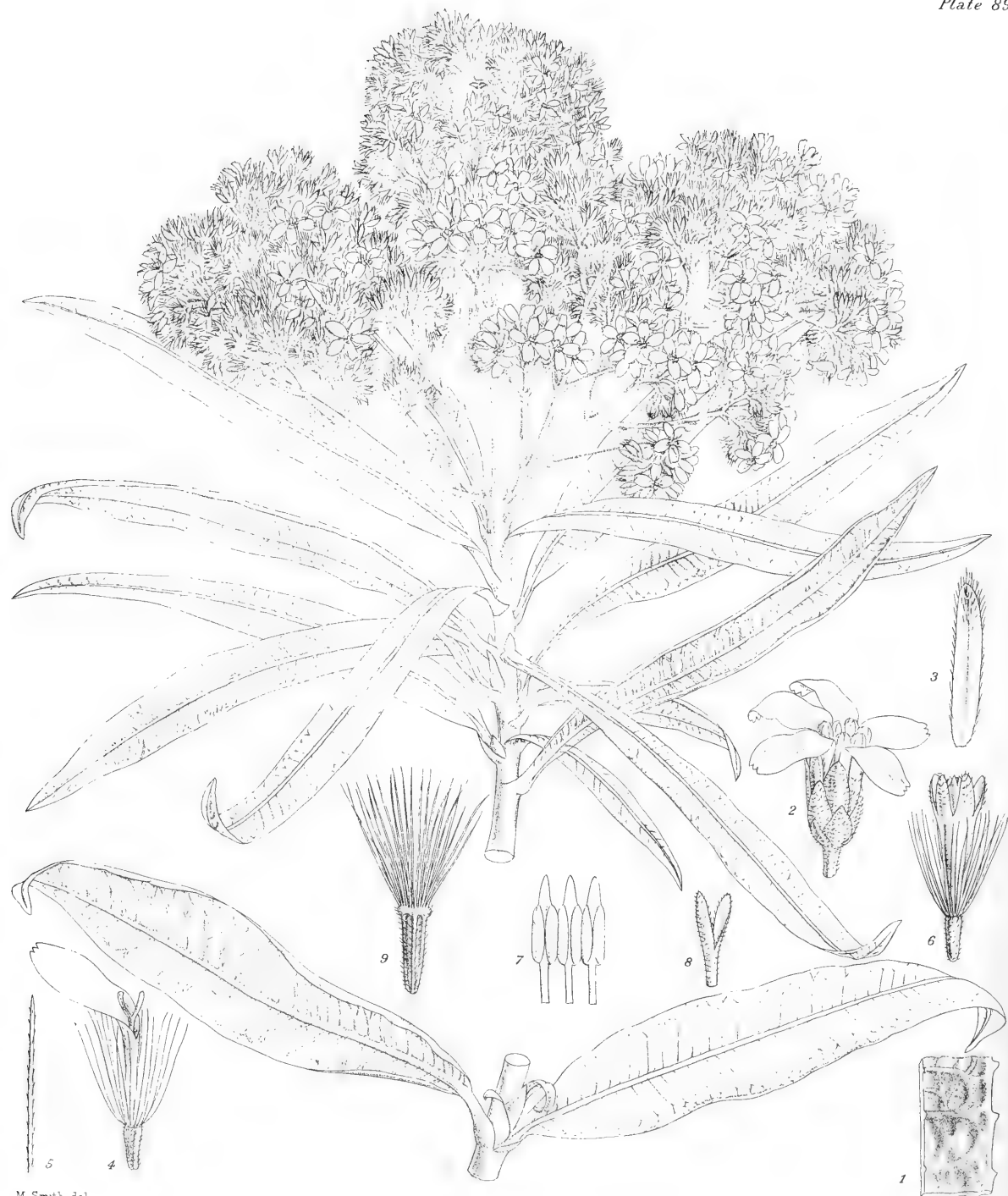
Olearia nitida is an abundant species to the south of a line drawn from Mount Egmont to the East Cape, especially in hilly and montane districts. It frequently lines the sides of river-gorges and mountain-creeks; and in summer, when covered with the multitudes of its flower-heads, with their white rays and yellow disc-florets, presents a very attractive appearance. It descends to sea-level in many localities in the South Island, and ascends to over 4,000 ft.

Few species of *Olearia* are more variable than *O. nitida*, and this fact has led to the publication of a number of "new species," which in reality are nothing more than trivial varieties. The late Mr. Colenso described four or five, which, after a careful examination of his type specimens, I cannot separate even as varieties. The three varieties *cordatifolia*, *angustifolia*, and *capillaris*, described in my Manual, show more important differences. It is possible that the first two may prove to be distinct species, but the variety *capillaris*, although remarkably distinct in its extreme form (which can be well seen on the Mount Egmont Ranges) can be traced step by step into the ordinary state.

Olearia nitida and its various forms are sharply differentiated from all its allies by the broad, thin, and almost membranous leaves, which are clothed beneath by a thin white and satiny tomentum very different to that of the other species.

PLATE 88. *Olearia nitida*, drawn from specimens collected on Mount Tauhara, Taupo, and on Mount Egmont. Fig. 1, bracts from the involucre ($\times 6$); 2, ray-floret ($\times 6$); 3, disc-floret ($\times 6$); 4, pappus-hair ($\times 12$); 5, anthers ($\times 10$); 6, style-arms ($\times 12$); 7, ripe achene ($\times 6$).





M. Smith del.
J. N. Fitch lith.

OLEARIA LACUNOSA, Hook. f.

West, Newman imp.

PLATE 89.—OLEARIA LACUNOSA.

FAMILY COMPOSITÆ.]

[GENUS OLEARIA, MENCH.

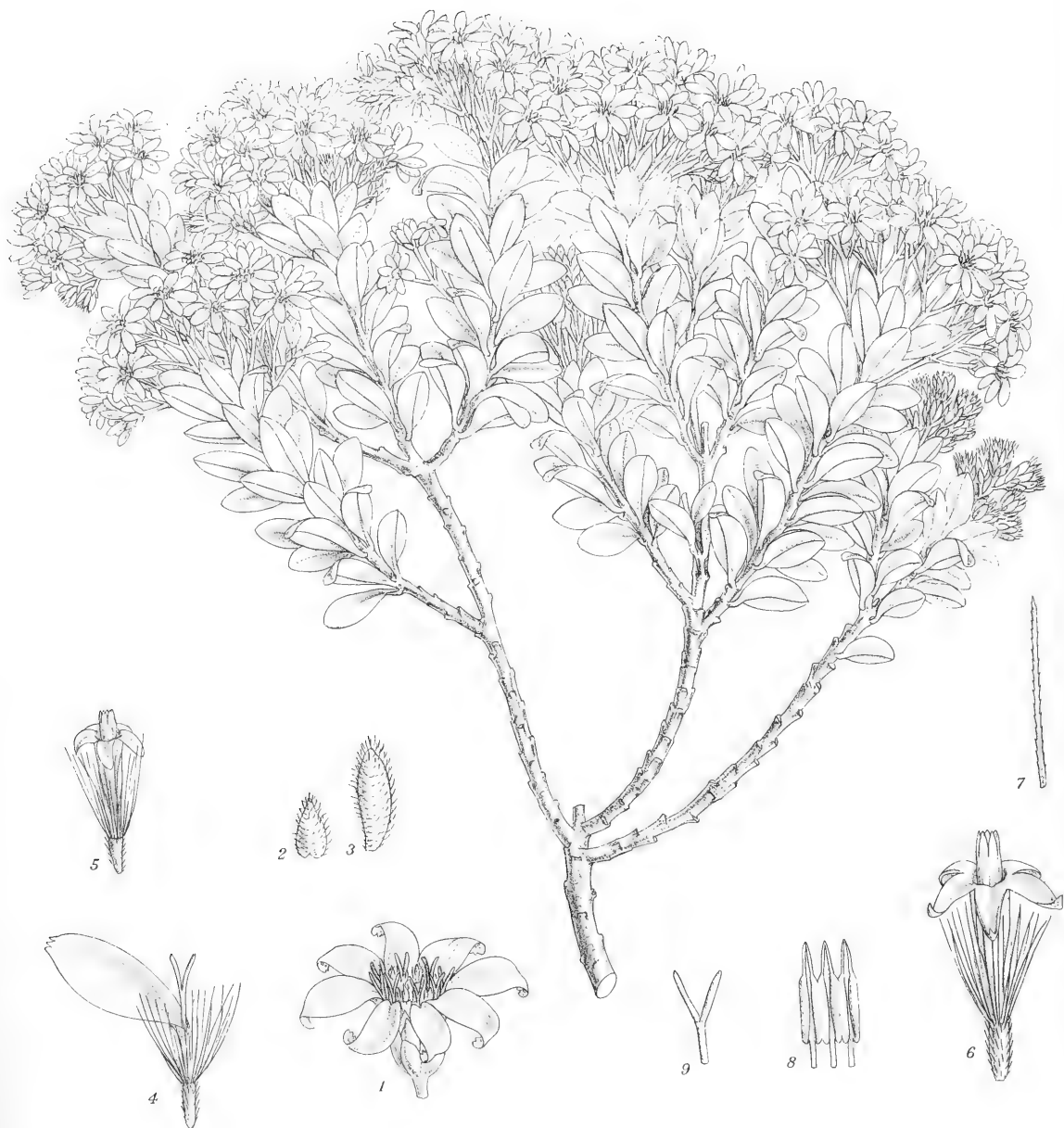
Olearia lacunosa, Hook. f. *Handb. N.Z. Fl.* 288; *Cheesem. Man. N.Z. Fl.* 288.

Mr. W. T. L. Travers, who made so many important botanical discoveries in the early days of European settlement in the South Island, was the first to collect this singular species. His specimens were gathered in 1864 on the mountains near Lake Rotoroa, one of the chief sources of the Buller River. In the following year it was observed by Sir Julius von Haast on Harper's Pass, at the head of the Hurunui Valley, which at that time offered the only practicable route across the Southern Alps. From specimens forwarded by these two explorers Sir J. D. Hooker described the plant in the second part of the "Handbook" (p. 732) under the name of *Olearia lacunosa*. Since then the known range of the species has been materially added to. It has been collected by Mr. Dall on the mountains at the sources of the Aorere and Heaphy Rivers; by myself at the head of the Takaka River, on the Mount Arthur Plateau, and on Mount Owen; by Mr. Townson on Mount Murchison and Mount Glasgow; by Mr. Petrie on the mountains flanking the Upper Teremakau; and by Dr. Cockayne by the Poulter River, in the Upper Waimakariri district, this being the most southern locality yet recorded. In addition to the above, the species also occurs in the North Island, on the western summits of the Tararua Range; for there can be little doubt that Mr. Buchanan's *O. alpina* must be referred to it as a narrow-leaved variety. Its altitudinal range is from 2,500 ft. to 4,500 ft.

O. lacunosa is a very distinct species. Its long narrow leaves are glabrous and reticulated above, but beneath are clothed with ferruginous tomentum, and furnished with a remarkably prominent midrib, from which numerous stout lateral veins are given off at right angles, thus dividing the under-surface into sunken interspaces, a character which is not known in any other New Zealand species. Its nearest ally is probably a plant recently described by Mr. Petrie under the name of *O. Crosby-Smithiana* (Trans. N.Z. Inst. xliii (1911), 254). This, however, has very much narrower leaves, usually $\frac{1}{10}$ in. to $\frac{1}{8}$ in. diameter, longitudinally grooved above, but with the margins revolute almost to the midrib beneath. It was gathered by Mr. Crosby-Smith near Lake Hauroto; but I have flowerless specimens in my herbarium collected by Mr. Reischek in Dusky Sound more than twenty years ago.

I have not seen *O. lacunosa* in cultivation, but its singular foliage should induce horticulturists to make the attempt to grow it. Most of the species of *Olearia* succeed in ordinary garden-soil, especially when it has received a slight admixture of peat.

PLATE 89. *Olearia lacunosa*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, portion of leaf-margin (enlarged); 2, flower-head ($\times 4$); 3, bract of involucre ($\times 8$); 4, ray-floret ($\times 4$); 5, pappus-hair ($\times 10$); 6, disc-floret ($\times 8$); 7, anthers ($\times 10$); 8, style-arms ($\times 10$); 9, ripe achene ($\times 8$).



M. Smith del.
J. N. Fitch lith.

OLEARIA MOSCHATA, Hook. f.

West, Newman imp.

PLATE 90.—OLEARIA MOSCHATA.

FAMILY COMPOSITÆ.]

[GENUS OLEARIA, MENCH.

Olearia moschata, Hook. f. *Handb. N.Z. Fl.* 127; *Cheesem. Man. N.Z. Fl.* 289.

Olearia moschata was originally discovered by Sir Julius von Haast in the year 1862, during his adventurous first visit to the headwaters of the Waitaki River, including in that term the various streams, of which the Godley, the Tasman, and the Ohau are the chief, which flow into Lakes Tekapo, Pukaki, and Ohau, and which have as their sources the largest and most extensive glaciers and snowfields in New Zealand. It was during this expedition that the first topographical and geological examination of the "Heart of the Southern Alps" was made, and some knowledge obtained of its rich and varied alpine vegetation. Two years afterwards the plant was observed by Mr. Buchanan in the Lake district of Otago, and since then it has been gathered by many observers in the central chain of the Southern Alps, from Arthur's Pass southwards to Lake Te Anau, at altitudes ranging from 2,000 ft. to 4,500 ft. On the eastern side of the Alps, however, it seldom occurs far from the central divide; or, in other words, it prefers the region of abundant westerly rains.

Olearia moschata is perhaps nowhere more abundant than in the Mount Cook district, where I have had repeated opportunities of observing it, and where it often constitutes an important part of the subalpine scrub, especially on old lateral moraines, or on the lower slopes of the mountains which everywhere steeply rise from the valleys. It usually forms a densely branched shrub from 3 ft. to 6 ft. in height, rarely more, and can be distinguished at once by its pale greyish-green colour, which offers a striking contrast to the majority of the shrubs which are usually associated with it. It is easily separated from its immediate allies by its small obovate leaves, pale tomentum, and broad many-flowered heads; in fact, I do not know any species with which it could be confounded. The strong musky fragrance of the leaves is very noticeable, especially after a spell of hot and dry weather; but a somewhat similar fragrance is found in other species of the genus.

PLATE 90. *Olearia moschata*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 3,000 ft. Fig. 1, flower-head ($\times 3$); 2 and 3, bracts of the involucre ($\times 6$); 4, floret of the ray ($\times 4$); 5 and 6, florets of the disc ($\times 4$); 7, pappus-hair ($\times 8$); 8, anthers ($\times 8$); 9, style-arms ($\times 8$).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

OLEARIA VIRGATA, Hook. f.

PLATE 91.—OLEARIA VIRGATA.

FAMILY COMPOSITÆ.]

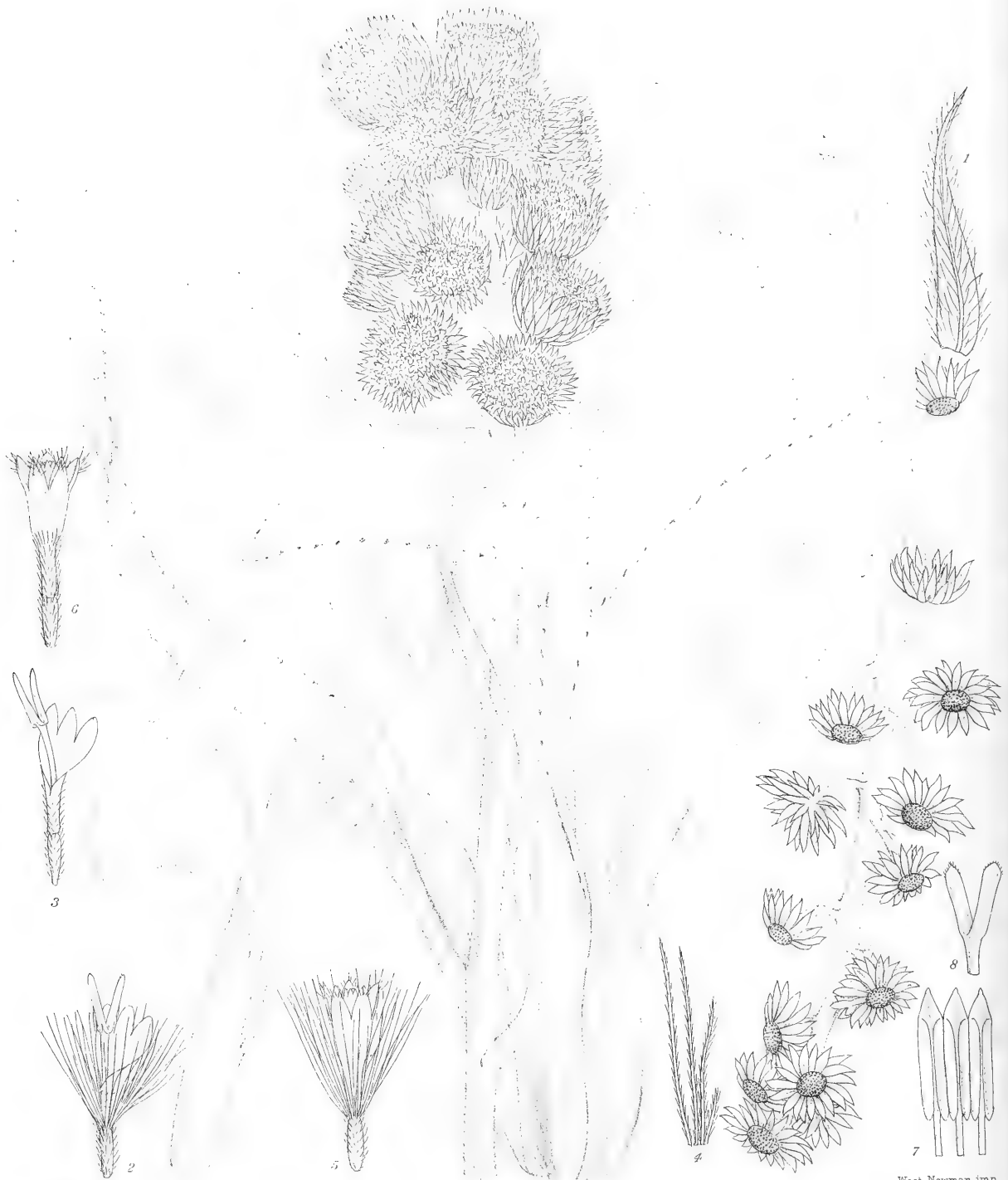
[GENUS OLEARIA, MENCH.

Olearia virgata, Hook. f. *Handb. N.Z. Fl.* 128; *Cheesem. Man. N.Z. Fl.* 294.

According to the "Flora Novæ Zelandiæ," the first specimens of this species were obtained by Mr. Colenso in "Bogs in the Wairarapa"; and it was shortly afterwards gathered by Mr. Bidwill in the Wairau Valley, Nelson. From this material the plant was described by Hooker under the name of *Eurybia virgata*. But in the "Handbook" Hooker abandoned *Eurybia* as a distinct genus, transferring the whole of the species to *Olearia*, our plant thus becoming *O. virgata*. It was quickly found to have an extensive range in the South Island, and is now known to extend beyond it into Stewart Island. In the North Island its distribution is not so general. It is, however, fairly plentiful on the eastern side of the Wellington Provincial District, and in Hawke's Bay, especially towards the base of the Ruahine Range. It occurs in several localities on the central volcanic plateau, and is found on the shingly beds of some of the rivers flowing from it into the Manawatu Bight. It has been gathered near Rotorua, and still further to the north there is an outlying locality near Waikino, in the Ohinemuri Valley.

O. virgata belongs to a peculiar section of the genus, all the species of which agree in having small narrow leaves arranged in opposite fascicles, and an inflorescence composed of few-flowered fascicles on short arrested branchlets. Five or six species are known, but all are very variable, and their distinguishing characters are by no means well ascertained. *O. virgata* is perhaps best separated by the linear-obovate leaves with white tomentum beneath, the solitary or fascicled heads, and the florets usually numbering from 5 to 12. *O. Solandri* has yellowish viscid tomentum on the branchlets and leaves beneath, solitary heads, and more numerous florets. *O. laxiflora* (an imperfectly known species) is said to have many flowered fascicles with slender pedicels; while *O. odorata* has a viscid and glandular involucre, and numerous florets. The whole of the species have much of the habit, foliage, and divaricating branches of some *Coprosma*s, and at a little distance might easily be referred to that genus.

PLATE 91. *Olearia virgata*, drawn from specimens collected in the Tasman Valley, Mount Cook district, at an altitude of 2,500 ft. Fig. 1, bract from the involucre (× 8); 2, flower-head (× 4); 3, floret of the ray (× 6); 4, disc-floret (× 6); 5, pappus-hairs (× 8); 6, anthers (× 8); 7, style-arms (× 8).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

PLEUROPHYLLUM HOOKERI, Buch.

PLATE 92.—PLEUROPHYLLUM HOOKERI.

FAMILY COMPOSITÆ.]

[GENUS PLEUROPHYLLUM, HOOK. F.]

Pleurophyllum Hookeri, Buch. in *Trans. N.Z. Inst.* xvi (1884), 395; *Cheesem. Man. N.Z.* Pl. 296.

The genus *Pleurophyllum*, of which three species are known, is confined to the islands to the south of New Zealand, and is in many respects a truly magnificent and imposing group of plants. Two of the species, *P. speciosum* and *P. criniferum*, were beautifully figured by Sir J. D. Hooker in the "Flora Antarctica" (Vol. i, tt. 22–25), and an inspection of the plates alone is quite sufficient to justify the enthusiasm of its discoverer, when he says, speaking of *P. speciosum*, *Celmisia vernicosa*, and *Bulbinella Rossii*, that "perhaps no group of islands on the surface of the globe, of the same limited extent and so perfectly isolated, can boast of three such beautiful plants" ("Flora Antarctica," vol. i, p. 73). The subject of the present plate is much smaller than the two original species, and can hardly be considered so attractive; but it is nevertheless well worthy of being figured, if only to complete the representation of such a striking and noteworthy genus.

P. Hookeri was first established as a species by Mr. Buchanan, who collected it in Campbell Island in December, 1883, finding it "common on the hills round Perseverance Harbour." But there can be little doubt that it was observed by Hooker in 1840, for in his account of *P. criniferum* he says, "I have seen it so dwarfish upon the mountains as barely to exceed a span in height, with all the leaves lanceolate, more densely silky, and thus even more nearly resembling *Argyroxiphium* than it does in its ordinary state." Had it been a little later in the season Hooker would have seen flowering specimens and at once recognized the distinctness of the plant. Three years previous to the publication of Mr. Buchanan's description Dr. Scott visited Macquarie Island and collected a *Pleurophyllum*, which he referred to *P. criniferum* (*Trans. N.Z. Inst.* xv (1883), 489). Specimens obtained in Mr. Hamilton's later visit of 1894, however, have proved that the plant was referable to *P. Hookeri* (*Trans. N.Z. Inst.* xxvii (1895), 567). In 1890 Mr. T. Kirk visited the southern islands and found *P. Hookeri* to be not uncommon on both the Auckland Islands and Campbell Island. He obtained good material of all the species, of which he made excellent use in his paper "On *Pleurophyllum*" (*Trans. N.Z. Inst.* xxiii (1891), 431), in which revised descriptions of the species were given, accompanied with valuable notes. Lastly, the expedition organized by the Philosophical Institute of Canterbury, which visited the islands in 1907, obtained much fresh information respecting *P. Hookeri* and its relationships to the other species.

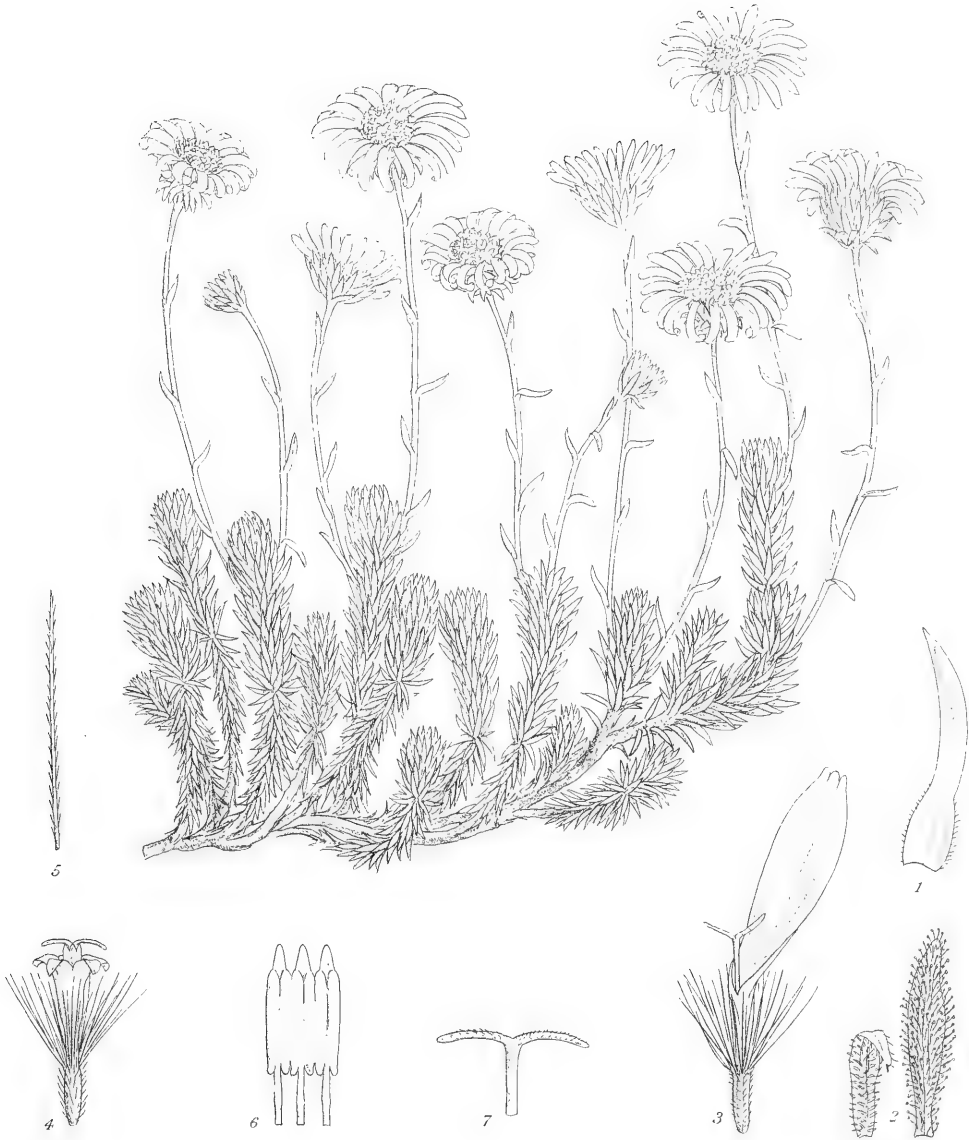
From the above it will be gathered that *P. Hookeri* is not uncommon in the Auckland Islands, Campbell Island, and Macquarie Island. All observers, however, agree in stating that it is usually found at some little height above the sea, whereas the two other species descend to sea-level. Dr. Cockayne, in his valuable paper on the ecological botany of the Subantarctic Islands, speaks of its chief habitat in the following terms: "Near the summit of the hills, in sopping wet though frequently stony ground, is a plant formation of a more or less open character, made up of many species which grow close to the surface of the ground. First and foremost, and giving a most striking appearance to the landscape, come the silvery

green rosettes of *Pleurophyllum Hookeri*, which may be solitary or several together from a branching stem. Frequently the plants grow closely together, and many square metres glisten with the silvery covering." The more conspicuous plants associated with the *Pleurophyllum* are *Celmisia vernicosa*, *Veronica Benthami*, *Bulbinella Rossii*, *Ranunculus pinguis*, and *Myosotis capitata*—all very handsome and noteworthy species.

P. Hookeri is most nearly related to *P. criniferum*, with which it agrees in the structure of the flower-heads, which are devoid of conspicuous rays. It differs in its much smaller size, the leaves seldom exceeding a foot in length (they are sometimes as much as 4 ft. in *P. criniferum*), and in both surfaces being clothed with silky silvery-white tomentum. The inner leaves are erect, as shown in the plate, but the outer ones are usually appressed to the ground, thus forming a rosette. A further difference from *P. criniferum* lies in the fact that that species dies completely down to the ground in winter, while in *P. Hookeri* there always remains a cluster of living leaves in the centre of the plant.

It is much to be desired that the three grand plants composing the genus could be established in some of the public gardens of the Dominion. So far, the attempts that have been made to establish them have met with very limited success.

PLATE 92. *Pleurophyllum Hookeri*, drawn from specimens gathered on the Auckland Islands by Mr. B. C. Aston, and on Campbell Island by Mr. R. M. Laing. Fig. 1, bract from the involucre ($\times 4$); 2, ray-floret ($\times 5$); 3, the same with the pappus removed ($\times 5$); 4, pappus-hairs ($\times 10$); 5, disc-floret ($\times 5$); 6, the same with the pappus removed ($\times 5$); 7, anthers ($\times 8$); 8, style-arms ($\times 8$).



M. Smith del.
J.N. Fitch litn.

West, Newman imp.

CELMISIA LATERALIS, Buch.

PLATE 93.—CELMISIA LATERALIS.

FAMILY COMPOSITÆ.]

[GENUS CELMISIA, CASS.]

Celmisia lateralis, Buch. in *Trans. N.Z. Inst.* iv (1872), 226, t. 15; *Cheesem. Man. N.Z.* Fl. 301.

Celmisia lateralis, which is one of the most distinct species of the genus, was originally discovered by Mr. H. H. Travers in 1871, on the mountains near Lake Guyon, in the southernmost portion of the Nelson Provincial District. Ten years later it was observed by the Rev. F. R. Spencer and myself on the Mount Arthur Plateau, north-west Nelson. About the same time Mr. R. Helms detected it on the coastal ranges near Greymouth, Westland, the most southern locality yet recorded. Mr. Townson, while exploring the vegetation of the Westport district, observed it in some quantity on Mounts Rochfort and Frederic, the two chief peaks of the abrupt coastal range which runs northwards from the mouth of the Buller River. On Mount Murchison, in the upper portion of the Buller Valley, he obtained a very distinct-looking variety in which the leaves are clothed with soft spreading glandular hairs, to which I have applied the varietal name of *villosa*. Lastly, Mr. F. G. Gibbs, who has done such excellent botanical work in the Nelson Provincial District of late years, has ascertained that it is not uncommon on the mountains to the north of Mount Arthur, as Mount Cobb, Diamond Lake Range, mountains near the Heaphy River, &c. It thus appears to be one of those species mainly confined to the western side of the main axis of the northern portion of the South Island. Its altitudinal range is from 3,000 ft. to 4,500 ft.

C. lateralis has an entirely different aspect from that of any other species, and can be recognized at a glance. The procumbent stems, which are almost woody at the base, the numerous ascending or suberect branches, and the small densely crowded linear-subulate leaves, incurved towards the tips of the branches, but spreading below, and which are green on both surfaces, are in combination a very striking set of characters. Its nearest allies are probably *C. Gibbsii* and *C. ramulosa*, although both of them have so many points of difference that the relationship is decidedly distant. Mr. Buchanan compared it with *C. laricifolia*; but that species differs altogether in habit, in the terminal peduncles, and in the narrower and more rigid almost acerose leaves, clothed with silky tomentum beneath. I do not place the two species in the same division of the genus.

PLATE 93. *Celmisia lateralis*, drawn from specimens collected on the Mount Arthur Plateau, Nelson, at an altitude of 4,000 ft. Fig. 1, leaf ($\times 6$); 2, involucre bracts, showing the glandular pubescence ($\times 4$); 3, ray-floret ($\times 4$); 4, disc-floret ($\times 4$); 5, pappus-hair ($\times 10$); 6, anthers ($\times 8$); 7, style-arms ($\times 8$).

the following is a list of the names of the persons who have been
admitted to the office of the Secretary of the Board of Education
since the last meeting of the Board, held on the 10th day of
January, 1904.



M. Smith del.
J. N. Fitch lth.

CELMISIA HAASTII, Hook. f.

West, Newman imp.

PLATE 94.—CELMISIA HAASTII.

FAMILY COMPOSITÆ.]

[GENUS CELMISIA, CASS.

Celmisia Haastii, Hook. f. *Handb. N.Z. Fl.* 131; *Cheesem. Man. N.Z. Fl.* 305.

Celmisia Haastii was first collected by Sir Julius von Haast in the autumn of 1862, during his adventurous exploration of the sources of the Waitaki River. A detailed account of this journey appears in his "Geology of Canterbury and Westland" (pp. 18-43), from which it will be seen that the district examined extended from the Godley River and its tributaries, flowing into Lake Tekapo; to the Tasman, discharging into Lake Pukaki; and the Hopkins, which enters the head of Lake Ohau. *C. Haastii* was gathered on "Mount Darwin," by which is probably meant one of the mountains between Mount Darwin and the Classen Glacier, at the head of the Godley River, for Haast certainly did not reach Mount Darwin itself. It was seen again during the same journey at the Hopkins River, and a year or two later was collected in the Lake district of Otago by Sir James Hector and Mr. Buchanan. Subsequent investigation has proved that it is not uncommon in the central and western portions of the Southern Alps, from the Spenser Mountains to the south of Otago. It is seldom seen below an altitude of 3,500 ft., and ascends to quite 6,000 ft.

In the Mount Cook district, where I have had several opportunities of observing this handsome species, it usually appears on the open mountain-sides above the level of the subalpine scrub, or at an elevation of about 4,500 ft. It is generally found in sheltered corners on steep banks, or on the abrupt sides of terrace-like projections. Associated with it at its lower level are such plants as *Ranunculus Lyallii*, *Senecio Lyallii*, *Celmisia discolor* and *C. Lyallii*, *Aciphylla Monroi*, *Gaultheria rupestris* (depauperated states), *Dracophyllum uniflorum* and *D. Kirkii*, and the grasses *Poa Colensoi* and *Danthonia semiannularis* var. *setifolia*. At higher elevations many of these species disappear, others taking their place, such as *Ourisia sessilifolia*, *Celmisia Hectori*, *Phyllachne Colensoi*, *Hectorella caespitosa*, and others. The highest altitude at which I have myself noticed the species is a little over 6,000 ft.

C. Haastii is readily distinguished by its peculiar greenish-grey foliage, stout usually tomentose scapes with numerous linear bracts, large flower-heads, membranous involucre scales, and glabrous achenes. Its nearest ally is probably *C. incana*; but that species differs altogether in habit and in the abundant soft white tomentum with which the leaves are clothed, and the aspect of the two plants is consequently very distinct.

PLATE 94. *Celmisia Haastii*, drawn from specimens collected in the Mount Cook district, at an elevation of 5,000 ft. Fig. 1, a single bract of the involucre ($\times 3$); 2, ray-floret ($\times 3$); 3, pappus hair ($\times 6$); 4, disc-floret ($\times 3$); 5, the same ($\times 6$); 6, anthers ($\times 8$); 7, style-arms ($\times 10$).



M. Smith del.
J. N. Fitch lith

West, Newman imp.

CELMISIA TRAVERSII, Hook. f.

PLATE 95.—CELMISIA TRAVERSII.

FAMILY COMPOSITÆ.]

[GENUS CELMISIA, CASS.

Celmisia Traversii, Hook. f. *Handb. N.Z. Fl.* 134; *Cheesem. Man. N.Z. Fl.* 306.

The genus *Celmisia* contains considerably over forty species, all but one being confined to New Zealand. Most of them are plants of considerable beauty; but it is doubtful if any one of them surpasses the subject of this plate, which is particularly remarkable for the contrast of colour in its leaves, a peculiarity which requires a coloured drawing to represent it in a proper manner. The upper surface of the leaf is dark brownish-green; the under-surface and margins are clothed with a rich and soft bright ferruginous tomentum; the midrib beneath and petiole are purple; while the leaf-sheath is covered with lax snow-white tomentum. When to a tuft of leaves like the above are added from two to six stout scapes also clothed with ferruginous tomentum, and bearing flowers sometimes 2 in. in diameter, it may well be imagined that the plant is one which would arrest the attention of the most incurious traveller.

C. Traversii is one of the many plants discovered by Mr. W. T. L. Travers in his early explorations of the mountain-flora of Nelson and Canterbury during the years between 1858 and 1864, and was first gathered on the "Discovery Peaks," one of the mountains overlooking the Waiau Valley, in southern Nelson. It was named in honour of its discoverer by Sir J. D. Hooker, and was published in the "Handbook" in 1864. Although frequently collected in the vicinity of the original station, it does not seem to have been noticed in any other district until 1881, when I observed it in great abundance on the Mount Arthur Plateau and the adjacent mountains, in north-west Nelson. In the following year I also collected it on the Raglan Mountains, to the east of the Wairau Valley. Mr. T. Kirk has gathered it on Mount Captain, between the Waiau and Clarence Valleys, and Mr. H. J. Matthews and myself have noticed it on Mount Percival and Mount Isabel, to the west of the Hanmer Plains. I have seen specimens collected between the Hurunui and Waiau Rivers, which appears to be its southern limit so far as is at present known. Its altitudinal range is from 3,200 ft. to 5,500 ft.

The nearest ally of *C. Traversii* appears to be *C. cordatifolia*, which, however, differs in the cordate leaf-base, and in the absence of the snow-white tomentum which gives such a distinctive appearance to the leaf-sheaths of *C. Traversii*. *C. petiolata* is mainly separated by the narrower and more membranous leaves, which are clothed with a thin whitish tomentum beneath, and by the longer and more slender scapes, with larger flower-heads. *C. Rutlandii* is smaller, and can be recognized at once by the appressed white satiny tomentum of the under-surface of the leaves.

PLATE 95. *Celmisia Traversii*, drawn from specimens gathered on Mount Isabel, Hanmer, at an altitude of 4,000 ft. Fig. 1, bracts from the involucre ($\times 3$); 2, ray-floret ($\times 3$); 3, pappus-hairs (enlarged); 4, disc-floret ($\times 3$); 5, anthers ($\times 8$); 6, style-arms ($\times 8$).

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It also mentions the results of the various committees and the work of the different departments.

2. The second part of the report deals with the financial situation of the country and the progress of the work during the year. It also mentions the results of the various committees and the work of the different departments.

3. The third part of the report deals with the social situation of the country and the progress of the work during the year. It also mentions the results of the various committees and the work of the different departments.

4. The fourth part of the report deals with the educational situation of the country and the progress of the work during the year. It also mentions the results of the various committees and the work of the different departments.



M. Smith del.
J. N. Pritch lith.

West, Newman imp.

CELMISIA PETIOLATA, Hook. f.

PLATE 96.—CELMISIA PETIOLATA.

FAMILY COMPOSITÆ.]

[GENUS CELMISIA, CASS.]

Celmisia petiolata, Hook. f. *Handb. N.Z. Fl.* 131; *Cheesem. Man. N.Z. Fl.* 307.

Celmisia petiolata, although not quite so handsome as the species figured in the previous plate, is still a most beautiful and attractive plant. With a very similar habit and mode of growth, it has narrower and much more membranous leaves, which are clothed beneath with a thin whitish tomentum, which thus replaces the striking covering of felted ferruginous hairs seen in *C. Traversii*. The scapes are more slender and usually more numerous, and the flower-heads are larger, being frequently as much as $2\frac{1}{2}$ in. in diameter.

So far as I can ascertain, Mr. W. T. L. Travers was its first discoverer, his specimens being obtained on the Hurunui Mountains, in North Canterbury. But it was gathered shortly afterwards by Dr. Sinclair in the Rangitata Valley, and a little later by Sir Julius von Haast in the Lake Ohau district, while Sir James Hector collected it on the western side of the Lake district of Otago. It is now known to be an abundant subalpine plant in the central and western portions of the Southern Alps, from Lake Tennyson to the south-west of Otago. At the same time, it never extends far beyond the influence of the abundant westerly rains. Its altitudinal range is from 2,000 ft. to 5,000 ft.

In the Mount Cook district *C. petiolata* is by far the most abundant species of the genus. It descends the valleys of the Tasman and Hooker to as low an elevation as 2,000 ft., and ascends the mountains to a height of fully 5,000 ft. In the river-valleys it occurs in open places among the subalpine scrub, or occupies sheltered nooks on the sides of the lateral moraines. On the sides of the mountains it is found in moist rocky hollows, especially where sheltered from strong winds, and is often found in company with *C. coriacea*, *Senecio Lyallii*, *Ligusticum Haastii*, and other well-known plants.

Mr. Kirk, in his "Students' Flora," associates a Stewart Island plant with *C. petiolata*, under the varietal name of *rigida*. It has more coriaceous and rigid leaves, and the tomentum of the under-surface is ferruginous, but otherwise there is little to separate it from the typical state. It is found on coastal cliffs only. Mr. Kirk also separated a second variety with the name of *membranacea*. This differs from the type in the more membranous leaves, which are glabrous or nearly so on both surfaces. The scapes and involucre bracts are also nearly glabrous. It has been gathered in the Upper Clarence and Waiau Valleys, and on the Lyell Mountains, on the other side of the Island.

PLATE 96. *Celmisia petiolata*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 2,500 ft. Fig. 1, margin of leaf ($\times 3$); 2, bracts from the involucre ($\times 3$); 3, ray-floret ($\times 3$); 4, disc-floret ($\times 3$); 5, pappus-hair ($\times 8$); 6, anthers ($\times 8$); 7, style-arms ($\times 8$); 8, transverse section of ovary ($\times 8$).





M. Smith del.
J. N. Fitch lith.

CELMISIA VISCOSA, Hook. f.

West, Newman imp.

PLATE 97.—CELMISIA VISCOSA.

FAMILY COMPOSITÆ.]

[GENUS CELMISIA, CASS.]

Celmisia viscosa, Hook. f. *Handb. N.Z. Fl.* 133; *Cheesem. Man. N.Z. Fl.* 312.

In several species of *Celmisia* the scapes, involucre bracts, and sometimes the leaves are slightly viscid: *C. densiflora*, *C. discolor*, and *C. incana* in particular possessing this peculiarity. But in the subject of this plate the leaves and their sheaths, the scapes, and the involucre bracts are all strongly viscid, so that it is not an easy matter to prepare specimens for the herbarium with ordinary drying-paper. And quite apart from its viscosity, it is a very different species from those figured in the two preceding plates. The thick and coriaceous linear leaves with their numerous parallel grooves and broad brown glabrous sheaths, the stout pubescent scapes with their linear bracts, and the tomentose involucre bracts are well-marked characters.

Celmisia viscosa was originally gathered by Sir Julius von Haast on Mount Torlesse, so well known from the commanding position that it occupies on the southern bank of the Waimakariri River, just before it leaves the mountains and emerges on to the Canterbury Plains. Some of Haast's first botanical collections were formed in this locality and in the adjoining Malvern Hills; so that in his "Geology of Canterbury and Westland" (p. 17) he says, "On the summit of these ranges and on the moving debris-slopes on their sides I made a rich harvest of particularly interesting plants, and when I mention that on Mount Torlesse alone I collected over two hundred flowering-plants, of which over thirty were new to science, it will easily be understood how great my delight was at being able to make such a remarkable addition to the alpine and subalpine flora of New Zealand." Of course, the New Zealand botanist of to-day knows that the flora of Mount Torlesse, varied and interesting though it may be, is only part of one which has a wide distribution in the mountains of the South Island, and that very few species, if any, are peculiar to the mountain itself.

Since the time of Haast's explorations *C. viscosa* has been gathered in many localities on the eastern side of the Southern Alps, from the mountains flanking the Wairau Valley, Nelson, to the Takitimo Ranges, to the south-east of Lake Manapouri. But I am not aware that it has ever been found on the western side of the dividing-range; in fact, my own experience is that the plant is most commonly seen on the arid mountains to the east of the central chain of the Alps. To take an example, it is abundant on the eastern slopes of the Mount Dobson Range, near Lake Tekapo, in some places forming the chief part of the vegetation above a height of 3,000 ft. But I searched in vain for it in the Mount Cook district, with its much more copious rainfall, and if it occurs at all its distribution must be very restricted.

C. viscosa is a somewhat isolated species, with no very close allies. It is probably best placed in the vicinity of *C. Lyallii*; which, however, has much longer and narrower more radiating leaves, almost pungent at the tips, and thus has a very different aspect.

PLATE 97. *Celmisia viscosa*, drawn from specimens collected on the slopes of Mount Dobson, Canterbury Alps, at an elevation of nearly 5,000 ft. Fig. 1, leaf with its sheath (natural size); 2, bracts of the involucre ($\times 4$); 3, ray-floret ($\times 4$); 4, disc-florets ($\times 4$); 5, pappus-hair (enlarged); 6, anthers ($\times 8$); 7, style-arms ($\times 8$).



M. Smith del
J. N. Fitch lith.

West, Newman imp.

CELMISIA HECTORII, Hook. f.

PLATE 98.—CELMISIA HECTORI.

FAMILY COMPOSITÆ.]

[GENUS CELMISIA, CASS.

Celmisia Hectori, Hook. f. *Handb. N.Z. Fl.* 135; *Cheesem. Man. N.Z. Fl.* 315.

This handsome little species was first collected by Sir James Hector and Mr. John Buchanan in 1862, during a geological and botanical exploration of the central and western portions of the Provincial District of Otago, the specimens being obtained at an altitude of between 5,000 ft. and 6,000 ft. on Mount Alta, situated on the dividing-range to the west of Lake Wanaka. In the following year it was also gathered by Sir Julius von Haast on Mount Brewster, to the north of Lake Wanaka. In 1864 Sir J. D. Hooker described the plant in the "Handbook" under the name of *C. Hectori*; but through an accidental omission no mention was made of Mount Alta, and the Mount Brewster locality was credited to "Hector and Buchanan." The error was corrected in the second part of the "Handbook," issued in 1867. Subsequent investigation has shown that the plant has a wide distribution on the mountains of western Otago, but always at considerable altitudes. Mr. Petrie has gathered it on the Humboldt Mountains, the Hector Mountains, Mount Tyndall, &c.; Mr. H. J. Matthews has given me specimens collected on Mount Earnslaw; and both he and Mr. Gibbs have gathered it on McKinnon's Pass, to the west of Lake Te Anau. The most northern locality from whence I have seen specimens is the Mount Cook district, where it was first collected by Mr. J. Dickson; but it probably extends through the alpine country at the sources of the Rangitata and Rakaia. It has been recorded by both Mr. Buchanan and Mr. Kirk from the Tararua Range, in the North Island; but it has not been noticed by any recent collector, and I fear that some mistake was made in the identification.

In the Mount Cook district, where I have repeatedly gathered it, *C. Hectori* usually occupies sheltered hollows at an elevation of between 5,000 ft. and 7,000 ft., often forming carpets many feet in diameter. When these are starred over by the numerous flower-heads the general effect is decidedly attractive. It is often associated with the handsome *Ourisia sessilifolia* (see Plate 158). Where the hollows are a little moister the charming *Ranunculus sericophyllus* (Plate 6) appears, sometimes accompanied by *Caltha novæ-zelandiæ*, the large bright-yellow flowers of the former being exceedingly conspicuous. All these plants can be seen not far from permanent snowfields, and every summer are occasionally covered for days together by falls of snow, which at these high elevations may occur at any time of the year.

C. Hectori is easily distinguished by the small size, the much branched prostrate stems, the densely imbricated linear-obovate leaves, silvery on both surfaces, and the large flower-heads. I cannot suggest a nearer ally than *C. linearis*, which, however, has a very different aspect.

PLATE 98. *Celmisia Hectori*, drawn from specimens collected on Mount Ollivier, in the Mount Cook district, at an altitude of nearly 6,000 ft. Fig. 1, bract from the involucre ($\times 3$); 2, ray-floret ($\times 3$); 3, pappus-hair (enlarged); 4, disc-floret ($\times 3$); 5, the same ($\times 4$); 6, anthers ($\times 8$); 7, style-arms ($\times 8$).



M Smith del
J.N Fitch lith

West, Newman imp.

CELMISIA GLANDULOSA, Hook. f.

PLATE 99.—CELMISIA GLANDULOSA.

FAMILY COMPOSITÆ.]

[GENUS CELMISIA, CASS.]

Celmisia glandulosa, Hook. f. *Fl. Nov. Zel.* i, 124; *Cheesem. Man. N.Z. Fl.* 318.

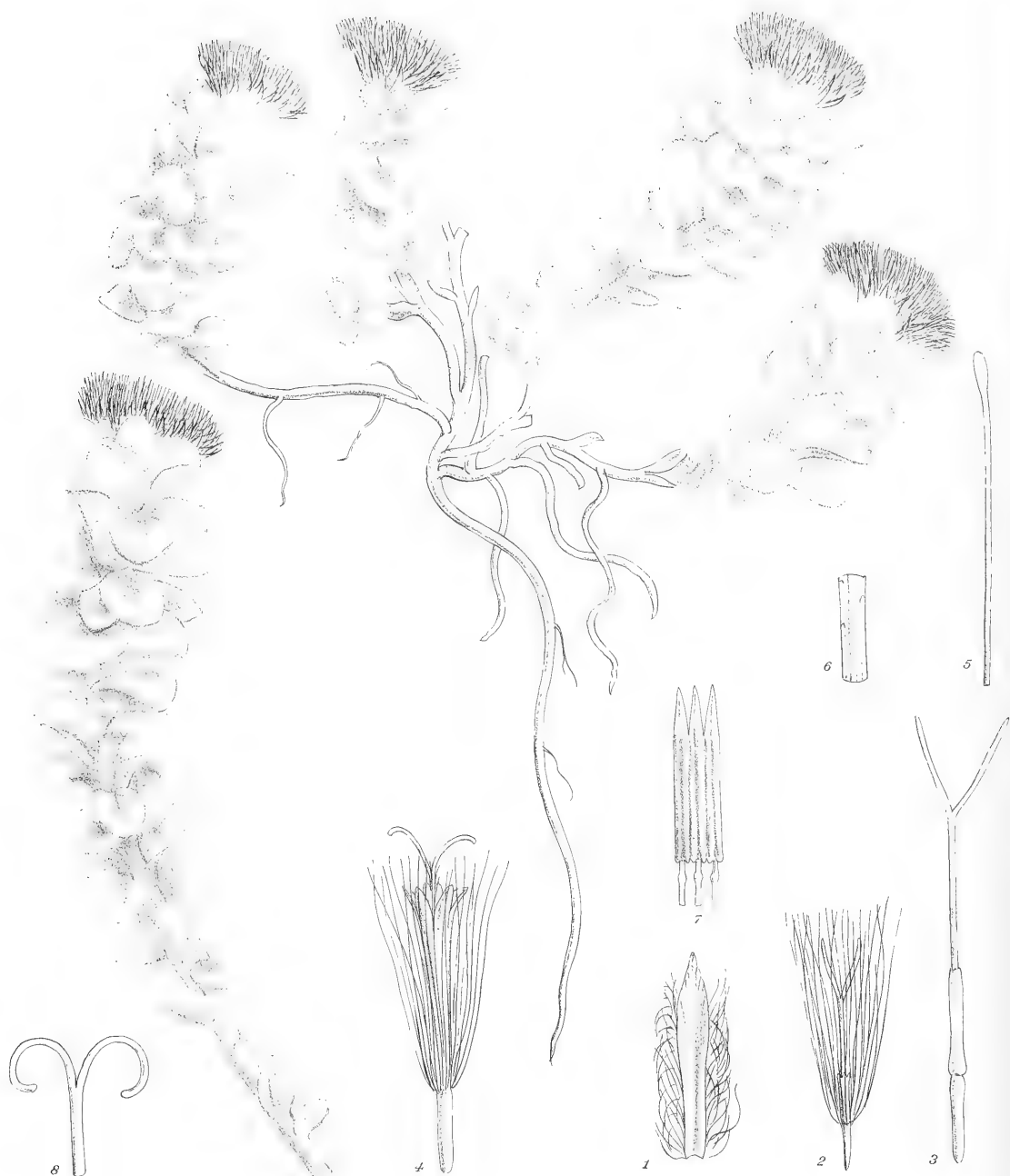
Celmisia glandulosa was originally discovered by Mr. Colenso in 1847 during an adventurous journey made into the interior of the North Island. At that time hardly anything was known of the central districts of the colony. The entire absence of roads, except the rough tracks used by the Native inhabitants, and a natural feeling of distrust as to the behaviour of the Maoris themselves, rendered most Europeans unwilling to undergo the certain labour and possible dangers of any expedition to a district remote from the sea-coast. In the journey alluded to Mr. Colenso, accompanied by a few Maori companions, travelled from Napier to Taupo, and thence to Lake Rotoaira and along the eastern base of Tongariro, Ngauruhoe, and Ruapehu. Reaching the Onetapu Desert, abreast of Ruapehu, he struck off to the south-east to the Moawhango River and the base of the Ruahine Mountains, which he was the first European to cross, and thus returned to Napier. Mr. Colenso has given a remarkably interesting and vivid description of this expedition in his little-known pamphlet on "The Ruahine Mountain Range," which after the lapse of more than sixty years is still well worth the perusal of any one interested in the natural history of the Dominion.

At page 40 of this pamphlet Mr. Colenso says, speaking of the Onetapu Desert, "On the edges of this lonely desert a lovely *Gentiana* flourished in all its beauty, probably *G. pleurogynoides*" (see Plate 140 of this work, where it is figured under the name of *G. bellidifolia*), "also *Celmisia spectabilis*, most luxuriant in gloriously fine tufts or tussocks, and with it grew a much smaller and different-looking species of *Celmisia* (*C. glandulosa*) for the first time here found, and both species tolerably plentiful." Since Mr. Colenso's visit every botanist who has visited the central volcanic plateau of the North Island has observed *C. glandulosa*, and it has also been gathered on the adjoining Kaimanawa Ranges. Curiously enough, however, it has not yet been noticed on either the Ruahine or Tararua Mountains. In the South Island it is not uncommon in mountain districts from north-west Nelson to the south-west of Otago. It is most often seen at an altitude of about 3,000 ft., but it descends as low as 1,500 ft., and ascends to above 4,000 ft.

In the South Island *C. glandulosa* is almost invariably found in peaty swamps, and might fairly be classed as a bog-plant. But at the base of Tongariro and Ruapehu it is commonly found in situations which are certainly dry for most of the year, and at no period could be described as swamps or bogs. In the same district, however, the plant can be seen in peaty swamps exactly as in the South Island. It is not at all easy to account for the fact that on the volcanic plateau of the North Island the plant has apparently found a greater range of habitats suitable for its growth than on the mountains of the South Island, with their much more diversified climate and physical features.

C. glandulosa is one of the most distinct species of the genus, and cannot possibly be confounded with any other. It may be recognized at a glance by the absence of the woolly tomentum so commonly present in the other species, which in this instance is replaced by a short and fine glandular pubescence. The creeping and rooting leafy stolons also constitute a prominent character, as also the acutely serrate or dentate leaves.

PLATE 99. *Celmisia glandulosa*, drawn from specimens collected near the base of Ngauruhoe, at an elevation of 4,000 ft. Fig. 1, portion of tip of leaf, showing the glandular pubescence and conspicuous teeth ($\times 5$); 2, bract from the involucre ($\times 4$); 3, ray-floret ($\times 4$); 4, disc-floret ($\times 4$); 5, pappus-hair ($\times 8$); 6, anthers ($\times 8$); 7, style-arms ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp

HAASTIA SINCLAIRII, Hook. f.

PLATE 100.—HAASTIA SINCLAIRII.

FAMILY COMPOSITÆ.]

[GENUS HAASTIA, HOOK. F.

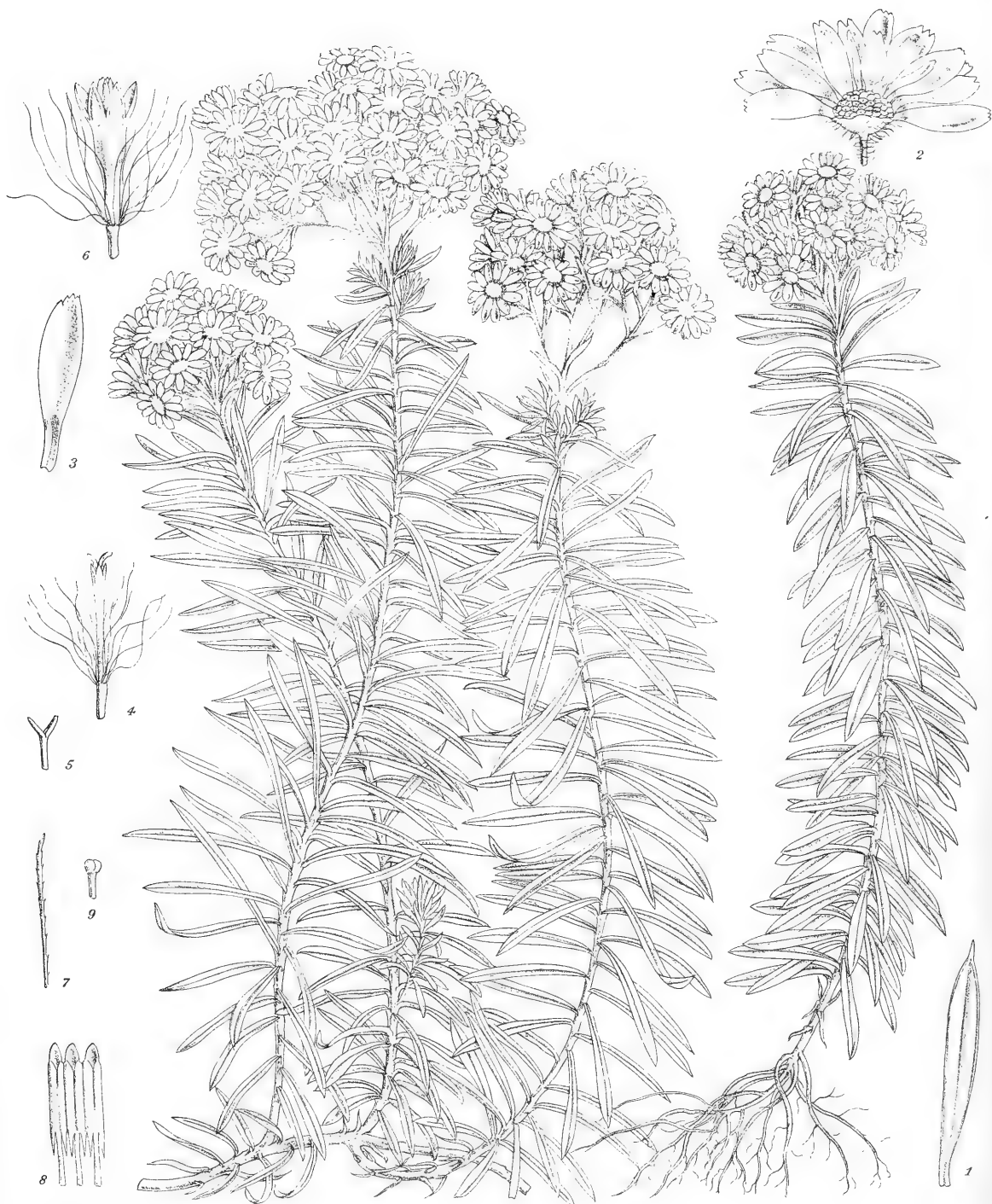
Haastia Sinclairii, Hook. f. *Handb. N.Z. Fl.* 156; *Cheesem. Man. N.Z. Fl.* 321.

The genus *Haastia*, which contains three or four species, all confined to New Zealand, was named by Sir J. D. Hooker to commemorate the services of Sir Julius von Haast, who was one of the first explorers of the Southern Alps, and who for many years displayed much ardour and enthusiasm in the elucidation of the alpine flora of the Dominion. The most prominent species of the genus is undoubtedly the very remarkable *H. pulvinaris*, one of the plants to which the name "vegetable sheep" has been given, and which forms huge greyish-green cushions several feet in diameter, the compacted branches and leaves being everywhere clothed with dense woolly hairs. When these rounded cushions are scattered over the rocky slopes of some mountain-summit, their appearance, seen from a little distance, amply justifies the local name that has been applied to the plant.

The species selected for illustration in this plate is the very different *H. Sinclairii*, which is a true "shingle-slip" plant, never found away from the slopes of dry shingle which form such a prominent feature on the eastern side of the Southern Alps. It has numerous rather remotely placed long and slender branches which are usually buried to their summits in the shingle, so that all that can be seen of the plant is the short leafy tips of the branches, looking like separate plants, and bearing a single large terminal flower-head. The plant has the usual greenish-grey colour of most shingle-plants, and even at a comparatively small distance is not at all easy to distinguish from the shingle.

Haastia Sinclairii was originally discovered by Dr. Sinclair on shingle-slopes at the Wairau Gorge, and a little later in the Awatere Valley. But it was soon found to have a wide distribution on the eastern side of the Southern Alps, and is now known to extend from the northern portions of the Mount Arthur Range southwards through the Canterbury Alps to the south-west of Otago; in fact, it has the most extensive range of any species of the genus. I am not aware, however, that it occurs in any locality well on the western side of the watershed of the Alps. Its altitudinal range is from 4,000 ft. to 6,500 ft., but it is most abundant at a height of about 5,000 ft. Its nearest ally is doubtless *H. recurva*. But that species is much larger, and is much more copiously branched, with more leafy branches. The leaves are sharply recurved, whereas they are usually flat in *H. Sinclairii*, and the indumentum of the plant is much more rufous. Finally, the flower-heads are smaller than in *H. Sinclairii*, and the pappus-hairs are connate at the base.

PLATE 100. *Haastia Sinclairii*, drawn from specimens collected on Mount Peel, Nelson, at an altitude of 5,000 ft. Fig. 1, bract from the involucre ($\times 3$); 2, outer floret ($\times 3$); 3, the same with the pappus removed ($\times 6$); 4, inner floret ($\times 3$); 5, pappus-hair (enlarged); 6, portion of the same (still more enlarged); 7, anthers ($\times 6$); 8, style-arms ($\times 6$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

GNAPHALIUM SUBRIGIDUM, Colenso.

PLATE 101.—GNAPHALIUM SUBRIGIDUM.

FAMILY COMPOSITÆ.]

[GENUS GNAPHALIUM, LINN.

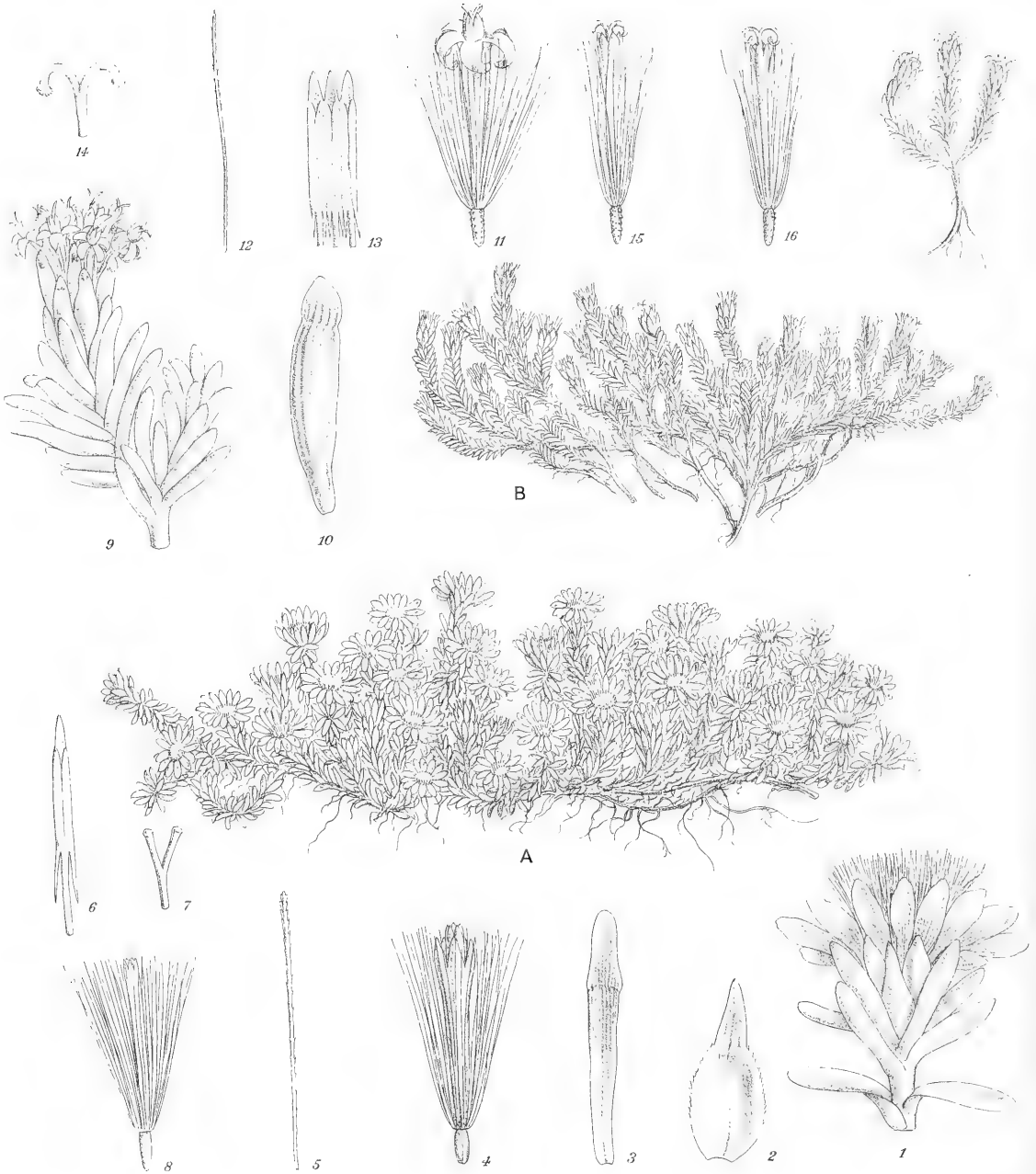
Gnaphalium subrigidum, Col. in *Trans. N.Z. Inst.* xvii (1885), 245; *Cheesem. Man. N.Z.* Fl. 324.

The subject of this plate was originally discovered by Mr. Colenso, prior to 1850, on the banks of the Manawatu River and on the Ruahine Mountains. Sir J. D. Hooker, in his "*Flora Novæ Zelandiæ*" (vol. i, p. 138), treated it as a form of the widely diffused *G. Keriense*, simply giving it the varietal name of *linifolia*, and this view has been followed by most botanists. But, as I have pointed out in the Manual, it differs from *G. Keriense* in the more rigid erect and bushy habit, much narrower, stiff, and coriaceous leaves with recurved margins, and in the capillary pedicels. It recedes from *G. Keriense* quite as much as *G. Lyallii* and *G. trinerve* do, and for the sake of consistency should be considered as distinct, unless the extreme course be taken of merging the four species into one. The name of *G. subrigidum* was first used by Mr. Colenso in 1885 for a plant gathered by Mr. Hill on the Ruataniwha Plains, which he took to be distinct from the original var. *linifolia* of Hooker. But I have failed to find any difference whatever between the two plants, and believe that they are absolutely identical.

So far as I am aware, *G. subrigidum* attains its northern limit on the Karangahake Cliffs, on Lake Taupo, where it is remarkably plentiful, associated with *Senecio Banksii* var. *angustatus*. From thence it stretches southwards on both flanks of the Ruahine Mountains, and on the western side of the Tararua Range. But it is by no means generally distributed, and is best regarded as a somewhat rare and local plant. In the South Island it is only known from Giles's Creek, near Westport, where it was observed by Mr. Townson a few years ago.

PLATE 101. *Gnaphalium subrigidum*, drawn from specimens collected on the Karangahake Cliffs, Lake Taupo. Fig. 1, leaf ($\times 2$); 2, section of flower-head and receptacle, the florets being removed ($\times 4$); 3, one of the involucre bracts ($\times 6$); 4, outer floret ($\times 12$); 5, style-branches of same ($\times 15$); 6, inner (or hermaphrodite) floret of the disc ($\times 12$); 7, pappus-hair from same ($\times 20$); 8, anthers ($\times 20$); 9, style-branches ($\times 15$).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

A. *RAOULIA SUBSERICEA*, Hook. f. 1-8.
B. „ „ *MONROI*, Hook. f. 9-16.

PLATE 102.—*RAOULIA MONROI* AND *RAOULIA*
SUBSERICEA.

FAMILY COMPOSITÆ.]

[GENUS *RAOULIA*, HOOK. F.

Raoulia Monroi, Hook. f. *Handb. N.Z. Fl.* 148; *Cheesem. Man. N.Z. Fl.* 330.

Raoulia subsericea, Hook. f. *Fl. Nov. Zel.* i, 136; *Cheesem. Man. N.Z. Fl.* 331.

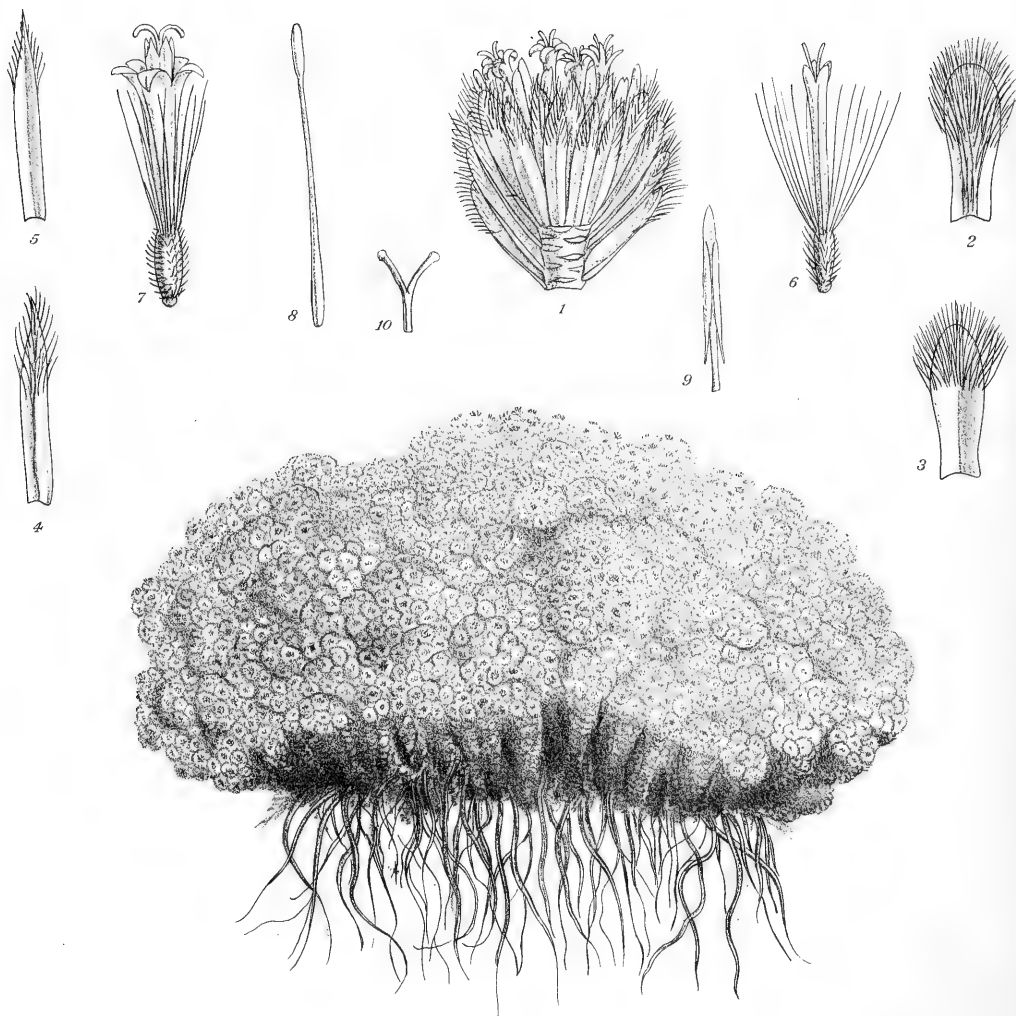
The genus *Raoulia*, as defined in the "Genera Plantarum," can be easily divided into two sections by the remarkable differences in the pappus-hairs. In the first section, which must be considered as the type of the genus, and to which the name of *Leptopappus* has been given, the pappus-hairs are soft and very copious, extremely slender, and are arranged in many series. In the second division, which bears the name of *Imbricaria*, the pappus-hairs are few, rigid and thickened above, and are arranged in one series. The generic distinctness of this group has always been suspected; and, through the researches of M. Beauverd, of the Boissier Herbarium, may now be considered as satisfactorily established. Further particulars on this point will be given under the following plate.

In the Manual I have divided the section *Leptopappus* into two subdivisions, in the first of which the inner involucre bracts are without white radiating tips, and in the second possess them. *Raoulia Monroi*, which belongs to the first subdivision, was originally discovered by Sir David Monro in the valley of the Waihopai, the chief tributary of the Wairau; but shortly afterwards was observed by Mr. W. T. L. Travers on the Canterbury Plains. It is now known from many localities on the eastern side of the South Island, from Nelson to Foveaux Strait; but I have no knowledge of any station on the western side of the Island. In Otago and some portions of Canterbury it frequently occurs at sea-level; and it and *R. australis* are the only species of the genus, so far as I am aware, that are found on sand-dunes. Inland it generally occurs in dry gravelly places, and is often seen creeping amongst grass and other vegetation, in this respect differing from the other species of the genus, most of which form homogeneous patches unmingled with other vegetation. I have observed it at an altitude of 3,500 ft. in the Clarence Valley, but as a rule it is rarely seen above 2,000 ft. It is probably nearer to *R. tenuicaulis* than any other species, but the uniform greyish-white colour, linear obtuse leaves, and obtuse involucre scales distinguish it at a glance.

R. subsericea belongs to the second subdivision of *Leptopappus*, in which the inner involucre scales are furnished with white radiating tips. In species with the habit of *R. subsericea*, which forms flat matted patches of prostrate interlaced branches, over which the flower-heads are profusely scattered, these radiating involucre scales give the heads a very conspicuous and attractive appearance. According to Sir J. D. Hooker, *R. subsericea* was first gathered by Lyall at "Port Cooper," now better known as Lyttelton Harbour; but more probably he obtained it from the shingle-beds of one of the large rivers crossing the Canterbury Plains. Since then it has been collected in many localities on the eastern side of the South Island, from Cook Strait to the south of Otago. Its altitudinal range is from 1,000 ft. (or probably less) to over 4,000 ft. As a species it is nearest to *R. glabra*, but has a stouter habit, shorter and more erect branchlets, longer and more silky leaves, and rather larger heads, with more conspicuous white tips to the inner involucre scales.

PLATE 102A. *Raoulia subsericea*, drawn from specimens collected in the Wairau Valley, Nelson, at an altitude of 2,000 ft. Fig. 1, summit of branch, showing leaves and a flower-head ($\times 4$); 2, one of the outer involucre bracts ($\times 12$); 3, an inner involucre bract ($\times 12$); 4, inner or hermaphrodite disc-floret ($\times 8$); 5, pappus ($\times 15$); 6, anther ($\times 15$); 7, style-branches ($\times 15$); 8, outer or female floret ($\times 8$).

PLATE 102B. *Raoulia Monroi*, drawn from specimens collected in the Awatere Valley, Marlborough, by Mr. J. H. Macmahon. Fig. 9, summit of branch, showing leaves and a flower-head ($\times 4$); 10, involucre bract ($\times 12$); 11, inner or hermaphrodite disc-floret ($\times 12$); 12, pappus-hair from same ($\times 15$); 13, anthers ($\times 15$); 14, style-branches ($\times 15$); 15 and 16, outer or female florets ($\times 12$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp

RAOULIA EXIMIA, Hook. f.

PLATE 103.—*RAOULIA EXIMIA*.

FAMILY COMPOSITÆ.]

[GENUS *RAOULIA*, HOOK. F.

Raoulia eximia, Hook. f. *Handb. N.Z. Fl.* 149; *Cheesem. Man. N.Z. Fl.* 332.

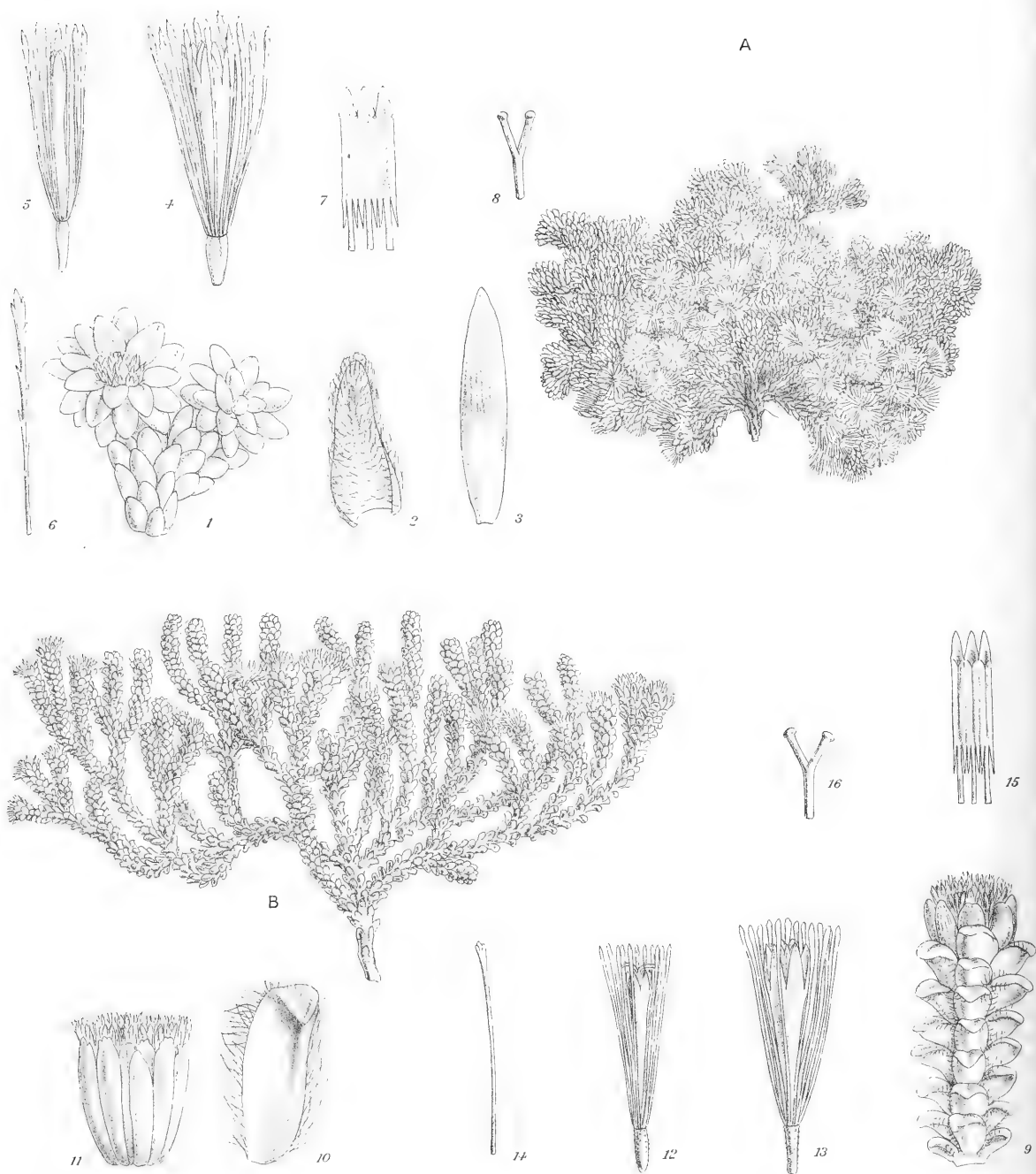
Raoulia eximia, which is one of the most remarkable plants in the New Zealand flora, became known to Europeans as soon as sheep-farming penetrated into the Southern Alps. Together with *Haastia pulvinaris*, it soon received the familiar title of "vegetable sheep," a name the aptness of which will be admitted by every one who has seen the huge woolly cushion-shaped masses which the two plants form on steep rocky slopes. When seen from a little distance the resemblance of these to a flock of sheep is very striking indeed. Our species was first made known to botanical science by Dr. Sinclair and Sir Julius von Haast, who collected it in the Upper Rangitata district in 1861; but it was soon found to be plentiful on all the higher rocky mountains of the Alps, from north-west Nelson to the south-west of Otago. It is always a high alpine, seldom seen below 4,000 ft., and ascending to quite 6,500 ft. in the Mount Cook district. It is usually found on bare wind-swept rocky slopes, or on the craggy crests of steep ridges. Occasionally it may be seen on little patches of rock surrounded by shingle-slopes; but, as Dr. Cockayne has correctly observed, it cannot be regarded as a true shingle-slip plant.

The cushions of *Raoulia eximia* are often of considerable size, sometimes nearly 4 ft. in diameter. The surface is quite hard and solid, and consists of the tips of the branchlets and their leaves, so closely compacted as to mutually press against each other, the interior of the plant being altogether hidden. If such a cushion is broken open—and it takes no small amount of force to do this—it will be seen that there is a central hard and woody stem of some little size, proceeding from a stout and deep-seated root. This stem gives off lateral branches, which towards their tips are repeatedly branched, giving rise to the leafy shoots which constitute the surface. Living leaves are only present towards the outside of the cushion, but below that the interior is largely composed of the dead and decaying remains of previous shoots and their leaves, all densely compacted into a perpetually moist peat-like substance often penetrated by adventitious rootlets from the younger shoots. In this respect the plant agrees with many other cushion-plants, both in New Zealand and elsewhere. One of the first references made to this peculiarity is that of Sir J. D. Hooker in the "Flora Antarctica" (vol. ii, p. 286), where, speaking of the very remarkable *Azorella caespitosa* (*Bolax glebaria*), which has a very similar habit to that of *R. eximia*, he states that the original root has become insufficient for the wants of the plant, and that the branchlets are nourished by "fibrous radicles, proceeding from below the leaves, and deriving nutriment from the quantity of vegetable matter which the decayed foliage of the lower part of the stem and other branches affords."

R. eximia falls into that division of the genus *Raoulia* to which the name *Imbricaria* was applied by Mr. Bentham in the "Genera Plantarum." As mentioned under the previous plate, it has long been suspected that the section was entitled to generic distinction, but until quite lately no botanist had made a careful investigation of the case. This has now been done by M. Gustave Beauverd, the well-known keeper of the Boissier Herbarium. As the result of a very complete and painstaking inquiry, published in the "Bulletin of the Botanical Society of Geneva" for 1910 (pp. 207-253), he has

founded the genus *Psychrophyton* for the reception of the species formerly included in *Imbricaria*. The genus is mainly characterized by the pappus-hairs, which are few in number, rigid, strongly compressed, thickened upwards, and furnished with clavate papillæ. In *Raoulia*, as now limited, the pappus-hairs are very numerous, thin, soft, and very slender. If M. Beauverd's conclusions are accepted, and they appear to be just and reasonable, then our plant will bear the name of *Psychrophyton eximium* (Hook. f.) Beauverd. Unfortunately, M. Beauverd's memoir did not reach me before this plate had been printed, otherwise I should have used his name.

PLATE 103. *Raoulia eximia*, drawn from specimens collected on Mount Dobson, Lake Tekapo, at an altitude of 5,000 ft. Fig. 1, summit of branch, showing a flower-head almost concealed by the upper leaves ($\times 4$); 2, leaf, showing outer surface ($\times 5$); 3, leaf, showing inner surface ($\times 5$); 4 and 5, bracts of the involucre, outer and inner surface ($\times 5$); 6, outer or female floret ($\times 8$); 7, inner or hermaphrodite disc-floret ($\times 8$); 8, pappus-hair (should have been represented as papillose, especially towards the summit) ($\times 15$); 9, anther ($\times 15$); 10, style-branches ($\times 15$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

A. RAOULIA HECTORI, Hook f. 1-8.
B. RAOULIA PETRIENSIS, T. Kirk. 9-16.

PLATE 104.—*RAOULIA* *HECTORI* AND *RAOULIA* *PETRIENSIS*.

FAMILY COMPOSITÆ.]

[GENUS *RAOULIA*, HOOK. F.

Raoulia Hectori, Hook. f. *Handb. N.Z. Fl.* 149; *Cheesem. Man. N.Z. Fl.* 333.

Raoulia Petriensis, T. Kirk in *Trans. N.Z. Inst.* ix (1877), 549; *Cheesem. Man. N.Z. Fl.* 334.

R. Hectori belongs to the section *Imbricaria* of the genus *Raoulia*, and to that group of it in which the inner involucreal bracts are not furnished with conspicuous white radiating tips. It was originally discovered by Sir James Hector and Mr. Buchanan on the mountains of the Lake district of Otago in the early part of the year 1863, and was subsequently found in several other localities in the provincial district by both Mr. Buchanan and Mr. McKay. Mr. D. Petrie, who has so assiduously explored the alpine vegetation of Otago, has also gathered the plant, and remarks (*Trans. N.Z. Inst.* xxviii (1896), 562) that it was "formerly common on all the high mountains of Central Otago, but is now rapidly dying off from the drying of the ground through burning and close cropping." Mount St. Bathans, Old Man Range, the Hector Mountains, Mount Pisa, Ben Lomond, &c., are special localities mentioned by Mr. Petrie. In 1880 Mr. J. B. Armstrong recorded it from the Provincial District of Canterbury, but without mentioning any special locality. In 1883 I gathered it in several stations on the Mount Dobson Range, to the east of Lake Tekapo, and in 1897 I again saw it in the same district. Its altitudinal range is from 4,000 ft. to 6,500 ft.

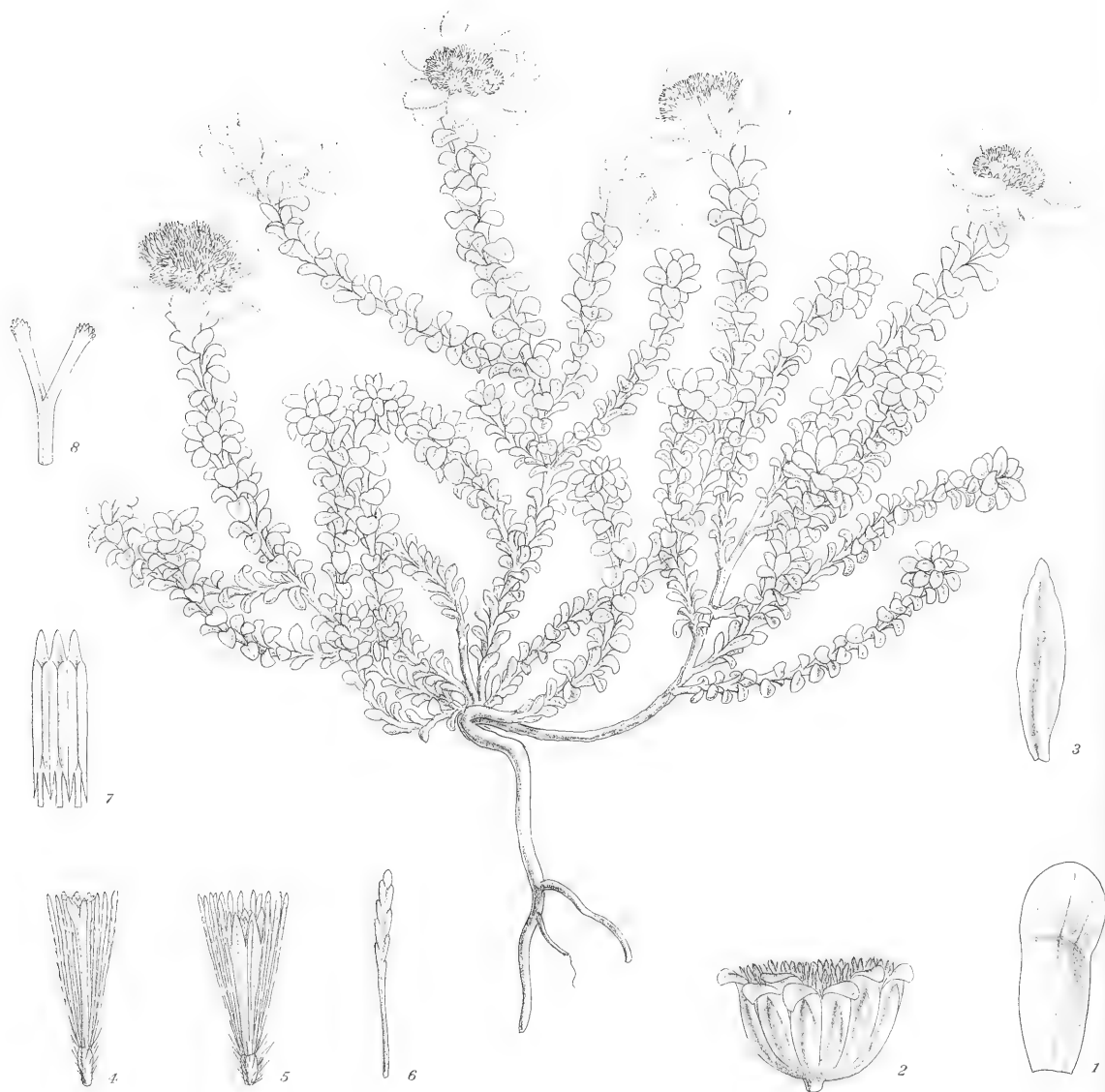
On Mount Dobson *R. Hectori* is usually found on steep rocky slopes, where it forms dense flattened patches, often covering considerable areas. It differs much in habit from all the other members of the section *Imbricaria*, and never shows any tendency to form the rounded cushion-like masses so characteristic of *R. eximia*, *R. mammillaris*, &c. I regard it as one of the most distinct species of the genus.

Raoulia Petriensis is one of the many fine plants added to the flora of New Zealand by Mr. D. Petrie, who gathered it in 1877 on Mount St. Bathans and Mount Ida, in Central Otago. So far as I am aware, it has not been found elsewhere in Otago; but it has been collected by myself on the Mount Dobson Range, in southern Canterbury, where it is associated with *R. Hectori*, and where it descends as low as 3,500 ft., ascending to 5,500 ft. It has a very peculiar loosely tufted habit, with long slender branches, which are clothed throughout with laxly imbricating leaves, the tips of which are spreading or recurved. It thus presents a very different appearance from all its allies.

PLATE 104A. *Raoulia Hectori*, drawn from specimens collected on Mount Dobson, near Lake Tekapo, at an elevation of 5,000 ft. Fig. 1, tip of branch, with flower-head ($\times 5$); 2, leaf ($\times 10$); 3, involucreal bract ($\times 10$); 4, inner or hermaphrodite floret of the disc ($\times 10$); 5, outer or female floret ($\times 10$); 6, pappus-hair ($\times 15$); 7, anthers ($\times 15$); 8, style-branches ($\times 15$).

PLATE 104B. *Raoulia Petriensis*, drawn from specimens collected in the same locality as the preceding. Fig. 9, tip of branch, with flower-head ($\times 3$); 10, leaf ($\times 12$); 11, flower-head ($\times 5$); 12, outer floret of the disc ($\times 8$); 13, inner disc-floret ($\times 8$); 14, pappus-hair ($\times 15$); 15, anthers ($\times 15$); 16, style-branches ($\times 15$).





M. Smith del.
J. M. Fitch hth.

West, Newman imp.

HELICHRYSUM GRANDICEPS, Hook. f.

PLATE 105.—HELICHRYSUM GRANDICEPS.

FAMILY COMPOSITÆ.]

[GENUS HELICHRYSUM, VAILL.

Helichrysum grandiceps, Hook. f. *Handb. N.Z. Fl.* 154; *Cheesem. Man. N.Z. Fl.* 341.

Helichrysum grandiceps and its near ally *H. Leontopodium* constitute a very distinct and noteworthy section of the genus *Helichrysum*, in external aspect closely resembling the well-known edelweiss of the Swiss Alps (*Leontopodium alpinum*). Sir J. D. Hooker was so greatly impressed by this resemblance that he used the name of *Leontopodium* as the specific title of one of the New Zealand plants; and Mr. Bentham, when forming a separate section for the two species, bestowed upon it the name of *Leontopodioides* ("Genera Plantarum," ii, 311). But the likeness to *Leontopodium* is purely superficial, for that genus differs altogether in the heads being more or less unisexual or even strictly dioecious, and in the hermaphrodite florets being all sterile, with undivided styles—characters quite unknown in either *H. grandiceps* or *H. Leontopodium*. M. Beauverd, to whose researches on the New Zealand *Compositæ* I have alluded under the genus *Raoulia*, considers that the two species are sufficiently distinct from *Helichrysum* to form a separate genus, to which he gives the name of *Leucogenes* (a paraphrase of the German edelweiss). He holds that it is well distinguished from *Helichrysum* by the broad spreading floral leaves, which are quite of a different type to the cauline leaves, by the hirsute achenes, and by the stout pappus-hairs, papillose above, but naked at the base, and not scabrid or pectinate as is usual in *Helichrysum*. If M. Beauverd's views are accepted, our plant will in future bear the name of *Leucogenes grandiceps*.

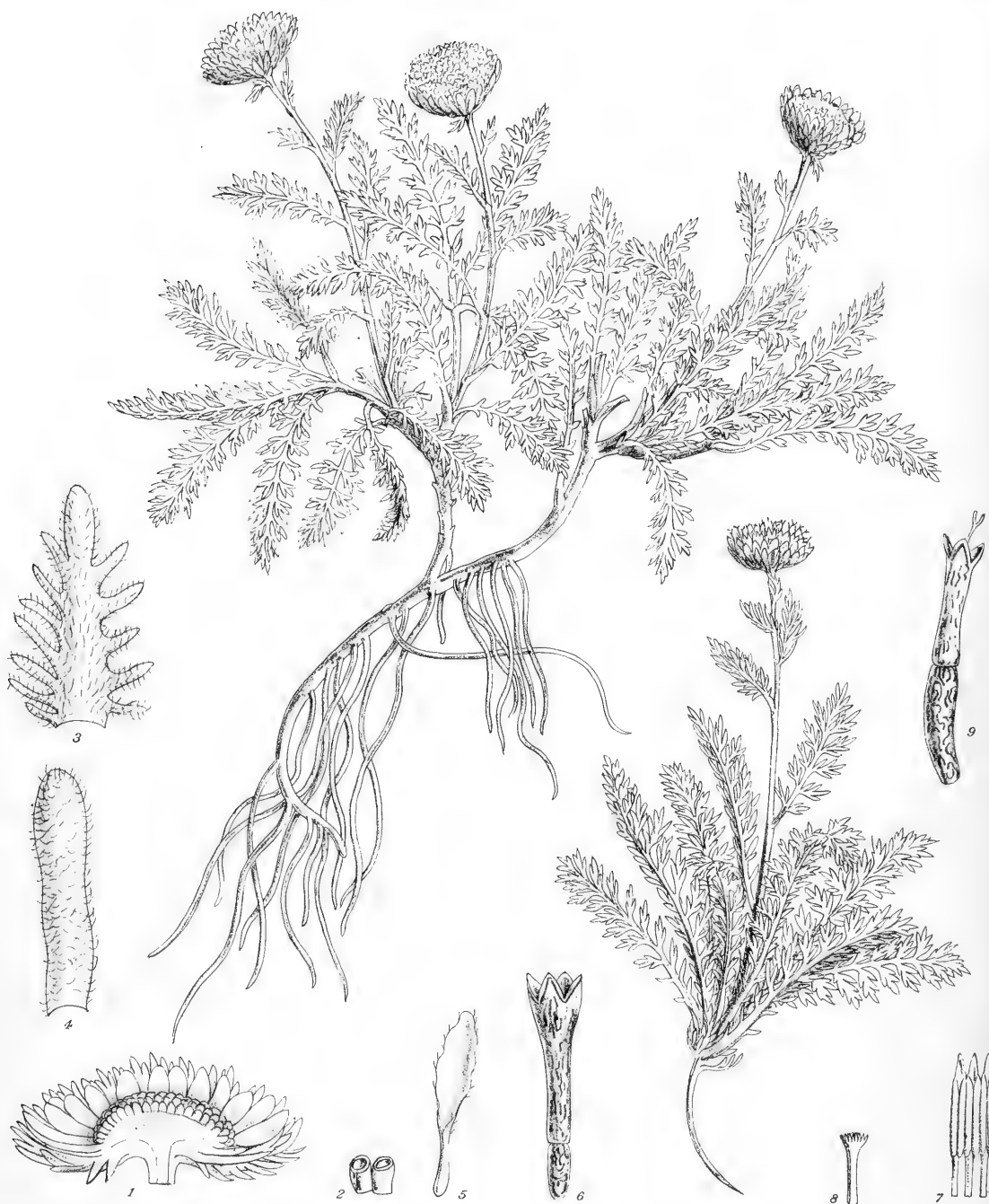
H. grandiceps was first gathered by Sir Julius von Haast and Dr. Sinclair in the Rangitata district in the early part of 1861. As the exploration of the Southern Alps progressed it was found to be of fairly general occurrence both on the eastern and western sides of the watershed. The most northern station known to me is on the Raglan Mountains, Nelson, but it probably exists on some of the higher peaks of the Dun Mountain Range. Although not uncommon in the alpine districts of southern Canterbury, it is apparently scarce in Otago. Mr. Petrie states (*Trans. N.Z. Inst.* xxviii (1896), 563) that it is "rather rare on the mountains of the north and west." Mr. H. J. Matthews collected it between Lake Te Anau and Milford Sound, and it has recently been gathered by Mr. Crosby Smith on the Princess Mountains, near Lake Hauroto. It attains its southern limit in Stewart Island, where, however, it appears to be confined to two or three of the higher peaks. As to its altitudinal range, I have seen it below 2,500 ft. in the Mount Cook district, where it also ascends to 5,500 ft.

Helichrysum Leontopodium, which represents *H. grandiceps* in the north of Nelson and on the higher mountains of the North Island, is the only species which can be said to be closely allied. But it can be easily distinguished from our plant by the numerous persistent basal leaves, which often form rosettes, and by the longer and more erect cauline leaves. But the difference between the two species can be better understood by comparing the beautiful photograph of *H. Leontopodium* given in Mr. Aston's "Botanical Notes of a

Journey across the Tararua's" (Trans. N.Z. Inst. xlii (1910), 13, t. 6) with the plate of *H. grandiceps* presented in this work.

H. grandiceps is essentially a rock-plant, and is usually seen on rocky slopes and ledges, or on the moraines of many of the glaciers. The resemblance which both it and *H. Leontopodium* bear to the European edelweiss has obtained for both plants the name of New Zealand edelweiss, by which they are now commonly known.

PLATE 105. *Helichrysium grandiceps*, drawn from specimens gathered on Arthur's Pass, Canterbury Alps, at an altitude of 3,000 ft. Fig. 1, leaf ($\times 4$); 2, flower-head ($\times 4$); 3, involucre bract ($\times 6$); 4, outer floret ($\times 8$); 5, inner disc-floret ($\times 8$); 6, pappus-hair ($\times 12$); 7, anthers ($\times 12$); 8, style-branches ($\times 15$).



M. Smith del.
J.N. Fitch lith.

COTULA ATRATA, Hook. f.

West, Newman imp.

PLATE 106.—COTULA ATRATA.

FAMILY COMPOSITÆ.]

[GENUS COTULA, TOURN.

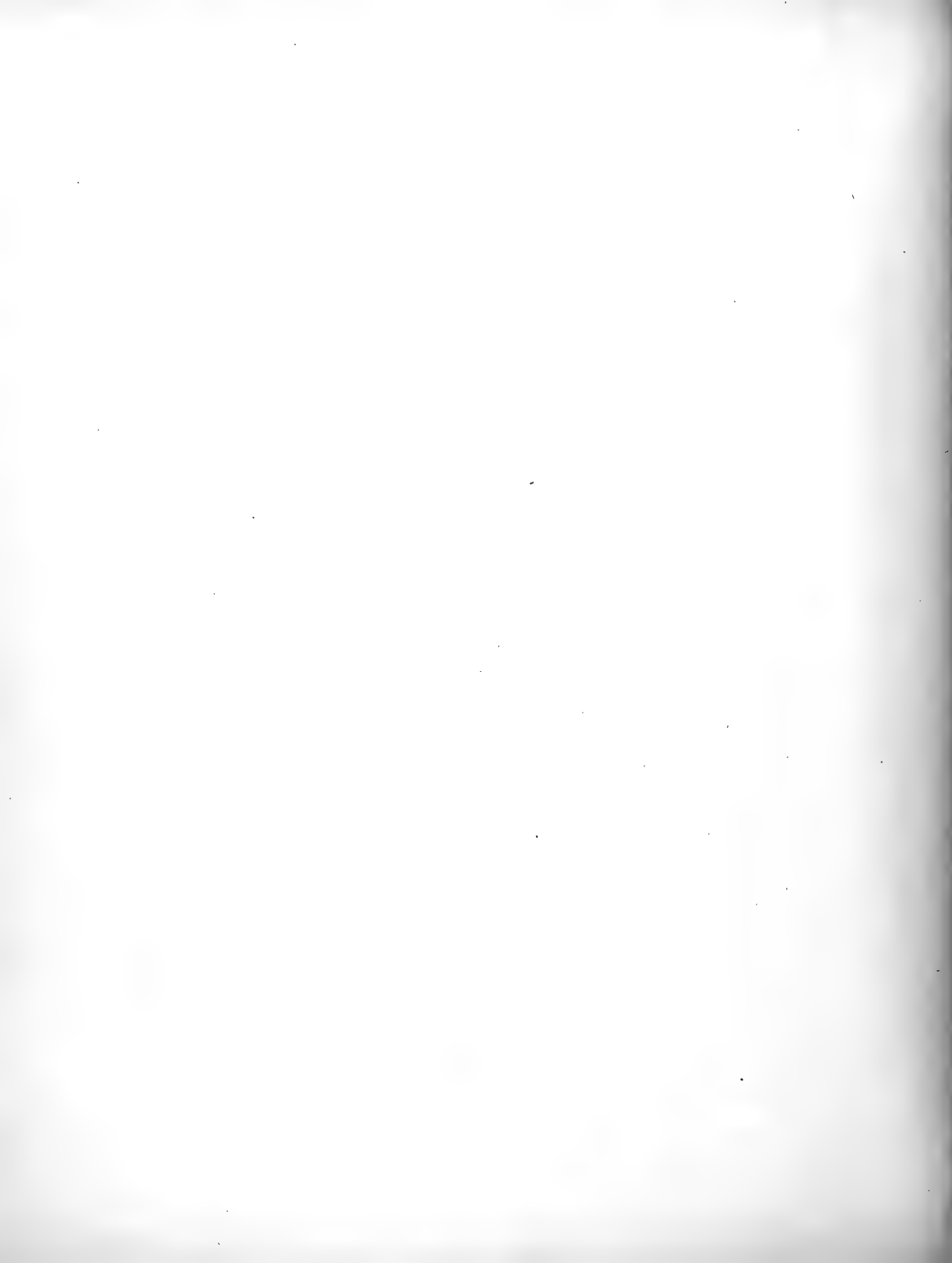
Cotula atrata, Hook. f. *Handb. N.Z. Fl.* 142; *Cheesem. Man. N.Z. Fl.* 352.

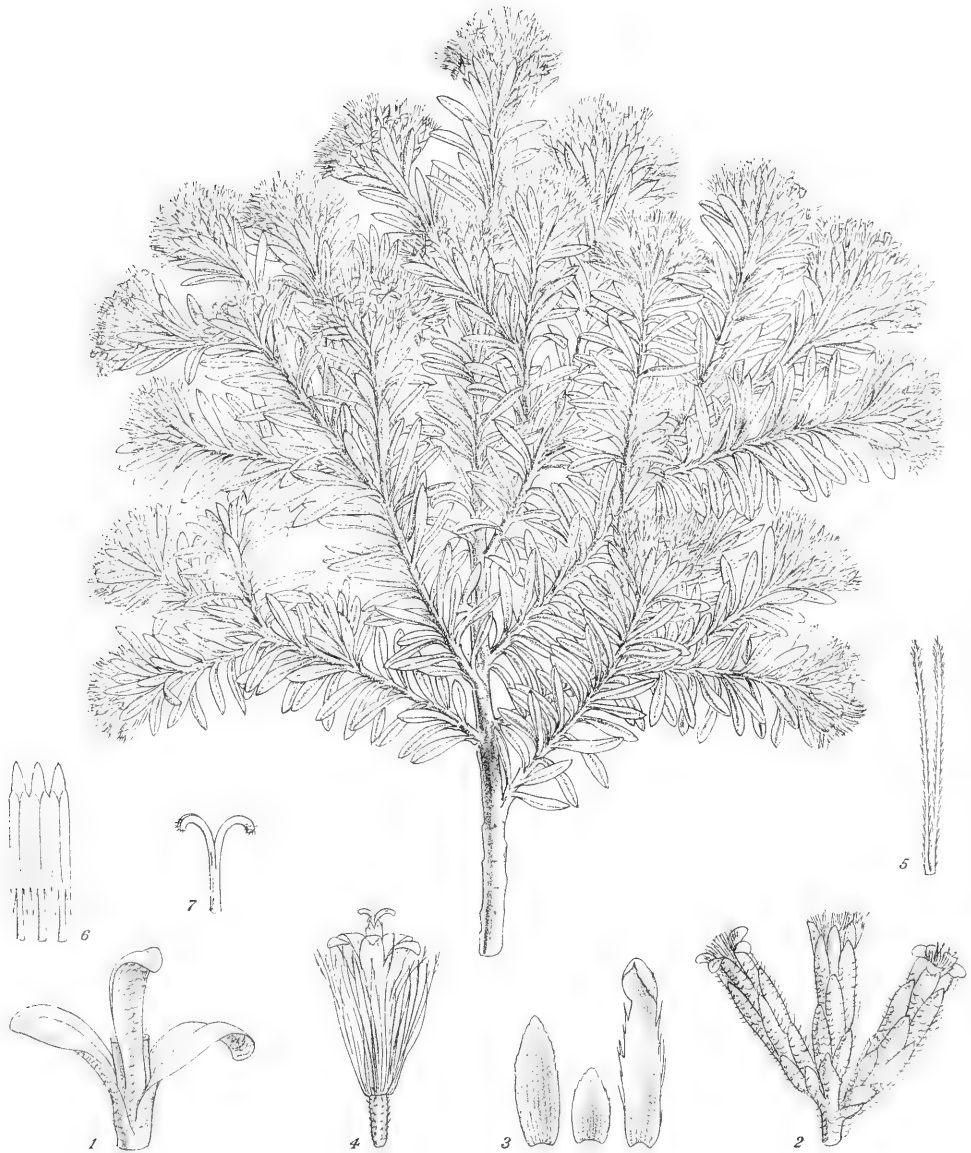
Under Plates 18 (*Stellaria Roughii*) and 66 (*Ligusticum carnosulum*) I have made some brief observations on that remarkable association of remotely allied plants found on the shingle-slopes that are so common on the flanks of the higher mountain-ranges of the South Island. The subject of the present plate is one of the species absolutely confined to slopes of moving shingle, and has the greyish-green colour, depressed habit, and tortuous rhizome with long stringy roots possessed by most of the plants found in such a habitat.

C. atrata was originally discovered by Dr. Sinclair on shingle-slopes at Tarndale, near the source of the Wairau River, Nelson; and shortly afterwards was collected in the same district (Wairau Gorge) by Mr. W. T. L. Travers. Mr. T. Kirk and myself both found it not uncommon on the mountains flanking the Clarence Valley, from Jollie's Pass to Lake Tennyson and the Spenser Mountains. Sir Julius von Haast, during his explorations in the Alps of Canterbury, found the plant to be fairly plentiful; and it has also been observed by Mr. J. B. Armstrong, Mr. J. D. Enys, and most recent botanists. In Otago it appears to be rare, the only localities yet recorded being Mount Kyeburn and Mount St. Bathans, where it was collected many years ago by Mr. Petrie. I am not aware of any locality for the species on the western side of the Alps. As for its altitudinal range, it ascends to 6,500 ft. on Mount Enys, near the sources of the Broken River, and I have seen it as low as 3,500 ft. in the Clarence Valley.

C. atrata is not closely allied to any other species. Its stout pubescent habit and greyish-green colour, much divided leaves, robust leafy peduncles, and large black or brownish-yellow heads are prominent characters, and will enable it to be recognized with the utmost ease.

PLATE 106. *Cotula atrata*, drawn from specimens gathered by Mr. F. G. Gibbs on shingle-slopes on Mount Arthur, Nelson, at an altitude of 5,000 ft. Fig. 1, section of receptacle, with the involucre bracts surrounding it ($\times 3$); 2, two papillæ from the disc of the receptacle, showing the foveolate apex ($\times 10$); 3, pinnatifid bract from the involucre ($\times 8$); 4, linear-obovate and entire bract from the involucre ($\times 8$); 5, floret with deformed corolla ($\times 8$); 6, hermaphrodite or sterile floret ($\times 8$); 7, anthers from same ($\times 10$); 8, style from same ($\times 10$); 9, fertile floret ($\times 8$).





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

CASSINIA AMOENA, *Cheesem.*

PLATE 107.—CASSINIA AMÆNA.

FAMILY COMPOSITÆ.]

[GENUS CASSINIA, R. BR.]

Cassinia amæna, *Cheesem.* in *Trans. N.Z. Inst.* xxix (1897), 391; *Cheesem. Man. N.Z. Fl.* 316.

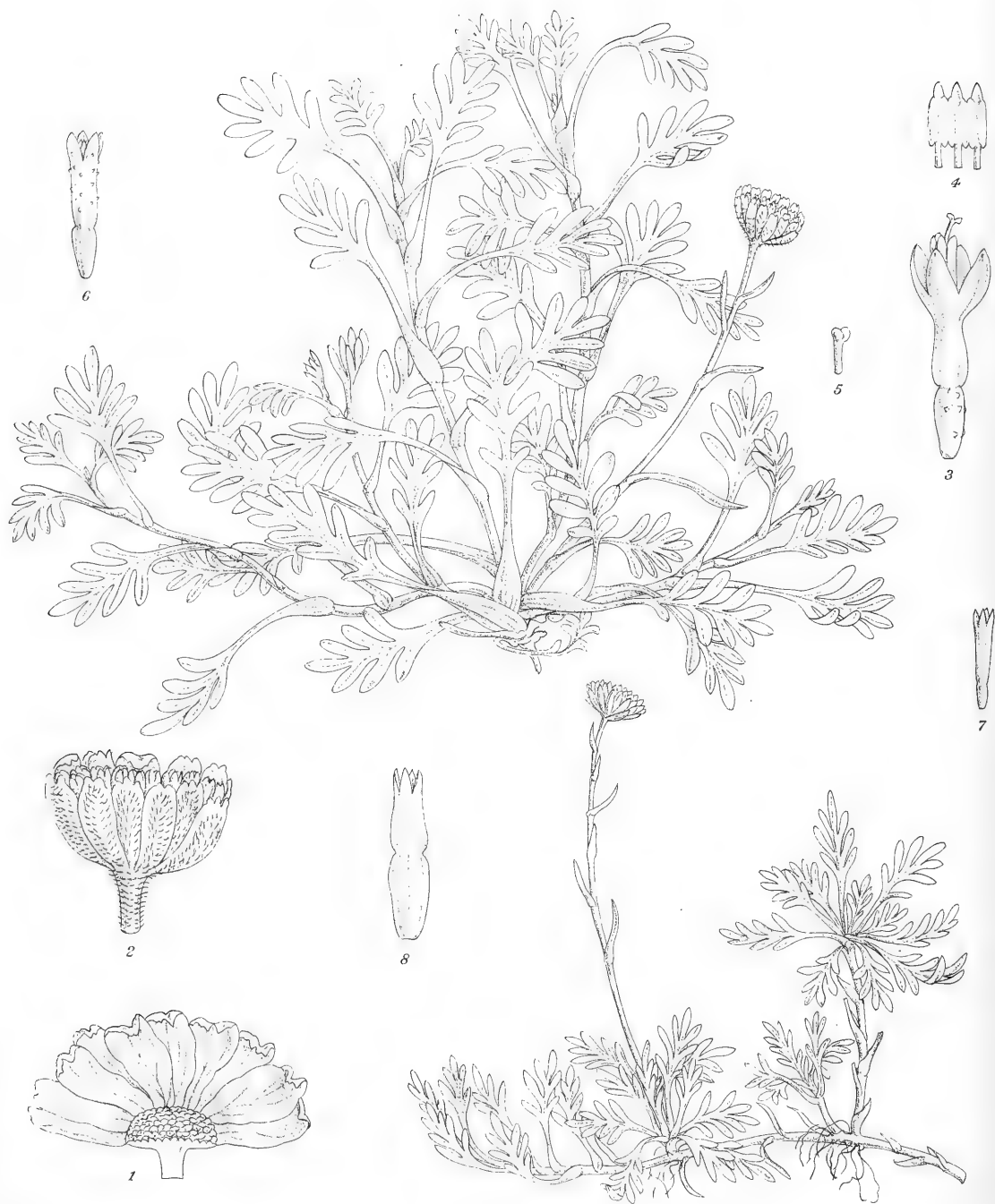
The genus *Cassinia* has five or six well-ascertained species in New Zealand, most of which have wide ranges, although none of them stretches through the whole length of the Dominion. North of the East Cape the predominant species is *C. retorta*; which, though not confined to sand-dunes, is always to be found in great quantity upon them. To the south of the East Cape *C. leptophylla* is the most common species, occurring both on sand-dunes and on coastal hills, and extending as far south as Marlborough and Nelson. *C. fulvida* is both coastal and montane, and is found from the East Cape to Foveaux Strait, and was reported by Mr. Kirk from Stewart Island. *C. Vauvilliersii*, which ranges from Taupo to the Auckland Islands, is usually montane and subalpine, although it descends to sea-level in the south of the South Island. *C. albida*, which appears to be confined to Marlborough, is mainly montane and subalpine.

C. amæna, the subject of this plate, differs from all the above in its exceedingly limited distribution. It was discovered by myself in 1896 on the North Cape Peninsula; and, so far as is known, is confined to the edge of the cliffs leading from Kerr Point, at the eastern end of Tom Bowline's Bay, to the North Cape proper; its habitat thus consisting of a strip about two miles in length and a quarter of a mile in breadth. The predominant vegetation noticed by me was stunted *Leptospermum* and *Schœnus tenax*, but *Leucopogon fasciculatus* and *Pomaderris Edgerleyi* were not uncommon. In several places great masses of *Veronica speciosa* were observed; and other interesting plants were *Haloragis cartilaginea*, *Geniostoma ligustrifolium* var. *crassum*, *Pittosporum pimeleoides*, *Corokia cotoneaster*, *Melicope simplex*, &c. Within the narrow limits mentioned above, the *Cassinia* was not uncommon, forming little round-topped bushes 1 ft. to 2 ft. in height, with exactly the habit of an alpine *Veronica* or *Pimelea*.

The nearest ally of *C. amæna* is undoubtedly *C. Vauvilliersii*, some forms of which approach it in habit. It can easily be distinguished, however, by the smaller size, narrower heads, fewer florets (usually from 4 to 6), and particularly by the almost total absence of scales among the florets. *C. retorta* and *C. leptophylla* are at once separated by the different habit and much larger size, smaller leaves, broader heads with more numerous florets, and by the numerous receptacular scales. In the absence of the receptacular scales *C. amæna* approaches the *Ozothamnus* section of *Helichrysum*, and might almost be referred to that genus, were not the habit and appearance of the plant nearer to *Cassinia*.

PLATE 107. *Cassinia amæna*, drawn from specimens collected at the North Cape. Fig. 1, portion of branch, with leaves ($\times 3$); 2, tip of branch, with three flower-heads ($\times 3$); 3, involucre bracts ($\times 3$); 4, hermaphrodite floret ($\times 8$); 5, pappus-hairs ($\times 12$); 6, anthers ($\times 12$); 7, style-branches ($\times 7$).





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

COTULA PYRETHRIFOLIA, Hook f.

PLATE 108.—COTULA PYRETHRIFOLIA.

FAMILY COMPOSITÆ.]

[GENUS COTULA, TOURN.]

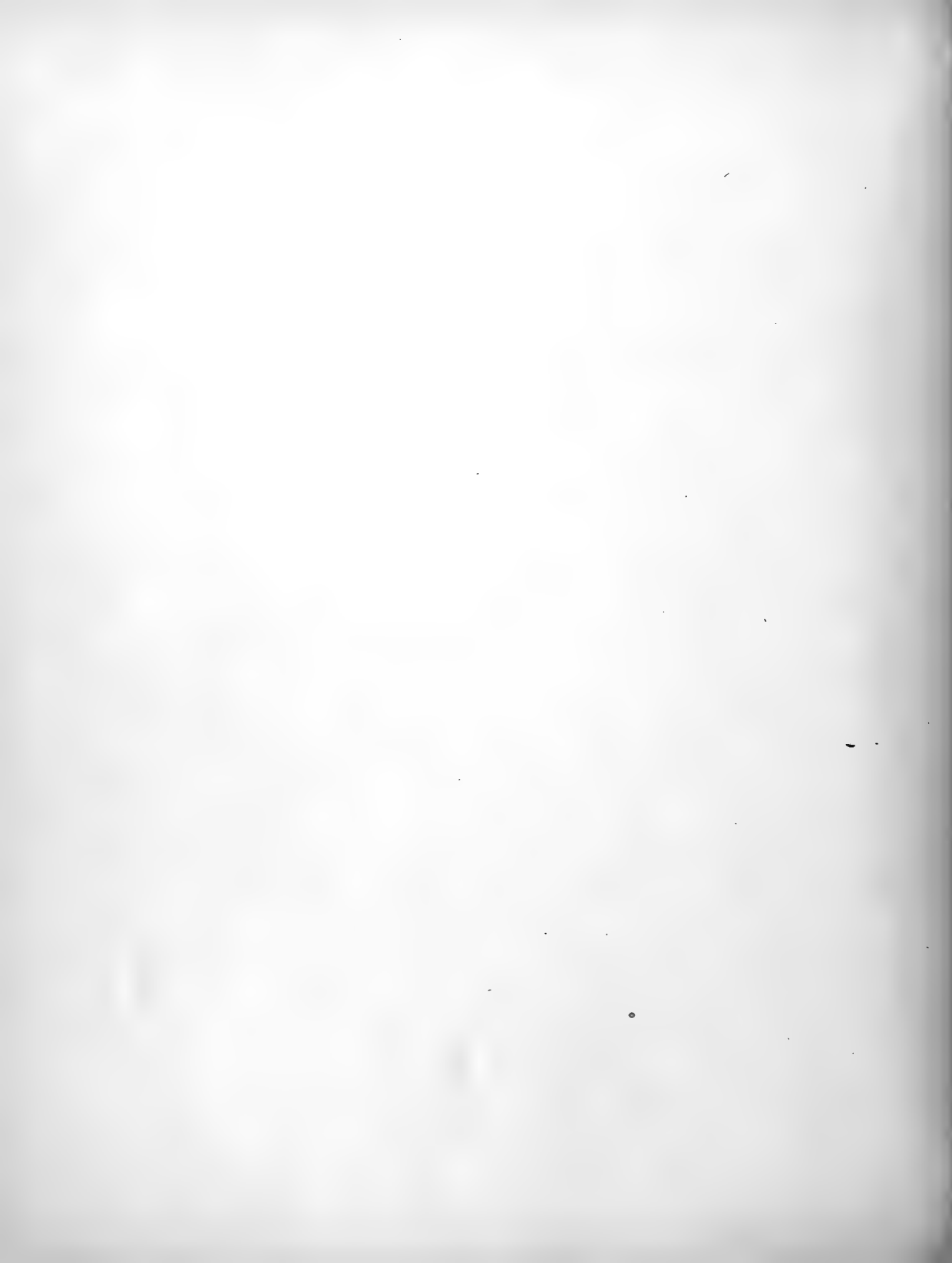
Cotula pyrethrifolia, Hook. f. *Handb. N.Z. Fl.* 142; *Cheesem. Man. N.Z. Fl.* 357.

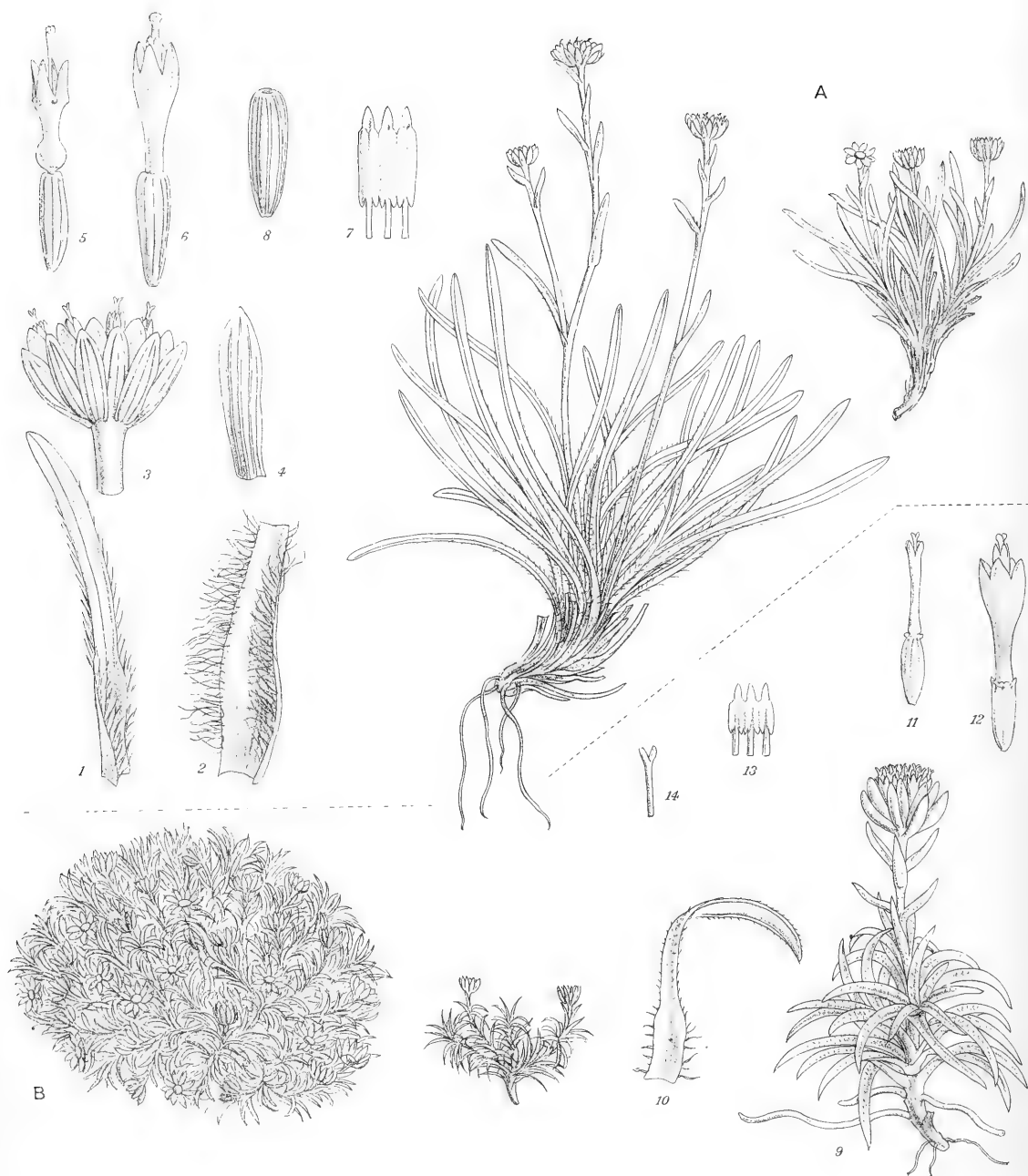
Cotula pyrethrifolia is a very different species to the one figured in Plate 106. The almost glabrous habit, the decumbent or prostrate stems, the deeply pinnatifid leaves with their few linear lobes, and the large strictly unisexual heads, mark it off from all the other species. Its only near ally is my *C. linearifolia*, which also has unisexual heads together with a very similar habit, but which differs in the much smaller size and entire leaves. All the other species of the section with unisexual heads have very different foliage and ebracteate scapes.

C. pyrethrifolia was originally discovered by Dr. Sinclair and Sir Julius von Haast in the Rangitata Valley; but was quickly found to have an extensive distribution in mountain districts in the South Island, both on the eastern and western sides of the watershed. I have seen specimens from almost all the important mountain districts, from the Mount Arthur Range, in north-west Nelson, and Mount Stokes, in northern Marlborough, to Lake Wanaka, which is the most southern locality of which I have any knowledge. Quite lately it has been gathered by Mr. Petrie and Mr. Aston on Mount Hector, one of the higher peaks of the Tararua Range, in the North Island. It is most plentiful at an altitude of from 3,000 ft. to 4,000 ft., but I have observed it at fully 6,000 ft. at the Wairau Gorge, and it descends to 2,500 ft., or perhaps lower, in eastern Canterbury.

C. pyrethrifolia is usually found in sheltered places among rocks, or on rocky slopes, when these are moderately stable. The finest specimens I have ever seen were gathered by Mr. J. Adams and myself in the deep rocky gorge just below the terminal face of the Waimakariri Glacier, at an altitude of about 3,500 ft., where it was remarkably plentiful. Like many species of the genus, it is highly aromatic, especially when bruised.

PLATE 108. *Cotula pyrethrifolia*, drawn from specimens collected by the Broken River, Canterbury, at an altitude of 3,500 ft. Fig. 1, section of receptacle, with the involucre bracts surrounding it ($\times 4$); 2, flower-head ($\times 4$); 3, female floret ($\times 10$); 4, anthers from the same ($\times 15$); 5, style-branches from the same ($\times 15$); 6 and 7, inner or sterile florets ($\times 10$); 8, ripe achene, with the corolla still attached ($\times 8$).





M. Smith del.
J.N. Fitch lith.

West, Newman imp.

A. *ABROTANELLA LINEARIS*, Bergg. 1-8.
B. " *PUSILLA*, Hook f. 9-14.

PLATE 109.—ABROTANELLA LINEARIS AND ABROTANELLA PUSILLA.

FAMILY COMPOSITÆ.]

[GENUS ABROTANELLA, CASS.

Abrotanella linearis, Berggr. in *Minnesk. Fisiog. Sällsk. Lund.* viii (1877), 14, t. 3, f. 28-38 ;
Cheesem. Man. N.Z. Fl. 361.

Abrotanella pusilla, Hook. f. *Handb. N.Z. Fl.* 139 ; *Cheesem. Man. N.Z. Fl.* 362.

Abrotanella is one of those genera often called antarctic ; not on account of inhabiting the Antarctic Continent, which in point of fact possesses only a single phanerogam, but because their species are mainly found on the land masses which approach most nearly to the Antarctic regions. Out of the fourteen species which compose the genus, seven are known from the New Zealand area, ranging from the Ruahine Range to the Auckland and Campbell Islands ; three are found on the Australian or Tasmanian mountains ; and three more occur either in Fuegia or on the Falkland Islands. In addition to the above, a single isolated species has been described from the Island of Rodriguez, to the eastward of Mauritius, being the only representative of the genus found within the tropics.

A. linearis was one of the discoveries made by Dr. S. Berggren, of Lund, Sweden, who in the years 1874 and 1875 travelled through the greater part of New Zealand for the purpose of studying its vegetation. His specimens were collected on Kelly's Hill, on the western side of the Otira Valley, Westland, and were fully described and figured by himself in a memoir issued under the auspices of the University of Lund. A few years later it was collected by Mr. T. Kirk and myself in many localities in the Provincial Districts of Canterbury and Nelson. It is now known to extend from the Mount Arthur Range, in the north-west of Nelson, throughout the whole length of the South Island, reappearing in Stewart Island, to the south of Foveaux Strait. As a rule, it is most plentiful on the western side of the watershed of the Alps. It ascends to quite 4,500 ft., and in the northern part of the South Island is seldom seen below 2,500 ft. In Stewart Island it descends to sea-level. It is usually found in damp sheltered places in subalpine meadows, or in open places amongst scrub, and is very variable in stature and in the length of its leaves.

A. pusilla was collected in 1845 by Mr. Colenso in his first journey to the Ruahine Range, one of the most adventurous expeditions made by Europeans during the first explorations of the interior of the Dominion. His specimens, which were gathered in "snowy places" on the summit of the range, were forwarded to Sir J. D. Hocker at Kew, and were described by him in the "Flora Novæ Zelandiæ" under the name of *Trineuron pusillum*. A few years later Professor Asa Gray showed that *Trineuron* and the allied groups, to which Hooker had given the names of *Ceratella* and *Scleroleima*, were not really separable from *Abrotanella* ; and in the "Handbook" Sir J. D. Hooker reduced all three to that genus.

For more than sixty years Colenso's plant was not gathered by any other botanist. In the summer of 1907, however, Mr. Petrie and Mr. Aston made an ascent of Mount Hector, the culminating-point of the southern portion of the Tararua Range, and were fortunate enough to obtain a fine series of specimens of it, some of which have been used in the preparation of this plate. Mr. Petrie remarks (*Trans. N.Z. Inst.* xl (1908), 295), "In the more level spots considerable areas of shallow, half-peaty, half-swampy soil are met with, and here the vegetation is very different. The most abundant and most characteristic plant is *Abrotanella pusilla*. . . . It is a very slender, low, densely matted, moss-like plant, with an inflorescence that barely exceeds the leaves, carpeting quite a large proportion of all wet and boggy ground. With it occur *Astelia linearis* (in fine fruit), *Carpha alpina*, *Centrolepis viridis*,



M. Smith del
J.N. Fitch lith.

ERECHTITES GLABRESCENS, T. Kirk.

West, Newman imp.

PLATE 110.—ERECHTITES GLABRESCENS.

FAMILY COMPOSITÆ.]

[GENUS ERECHTITES, RAFIN.

Erechtites glabrescens, *T. Kirk in Trans. N.Z. Inst.* ix (1878), 550; *Cheesem. Man. N.Z.* Fl. 366.

Erechtites glabrescens was discovered by Mr. W. T. L. Travers in the Wairau Valley, Nelson, prior to 1872; but was not described as a distinct species until 1876, when Mr. T. Kirk conferred upon it the name it now bears. In the meantime it had been observed by Mr. Kirk himself at Lake Rotoiti, Nelson, and by Mr. G. M. Thomson in several localities in Otago. Further inquiry has shown that it has a tolerably wide range, usually in mountain-forests or in scrub. In the North Island it has been gathered by Mr. Petrie in the Upper Rangitikei, and by Dr. Cockayne and myself on the central volcanic plateau; and it will probably yet be discovered in the mountain-woods flanking the Ruahine and Tararua Ranges. In the South Island it is found in most mountain-forests from Nelson to Foveaux Strait. It attains its southern limit in Stewart Island, where it descends to sea-level, as it also does in the south of Otago. In the North Island and in the Nelson mountains it ascends to quite 4,500 ft.

E. glabrescens can be distinguished without much difficulty from the other species found in New Zealand. Its habit is more slender, and it is almost entirely glabrous. The leaves are more membranous, and vary excessively in size and in the extent to which they are cut or divided. Occasionally all the leaves are coarsely and irregularly sinuate-dentate, but more generally the lower ones are pinnate with a large terminal leaflet and with few or many smaller lateral ones. The under-surface is frequently of a purplish colour. The heads are almost or entirely glabrous, the involucrel bracts being greenish with pale margins. The achenes are longer than in any other New Zealand species, and are quite glabrous.

PLATE 110. *Erechtites glabrescens*, drawn from specimens collected in the Mount Cook district, at an altitude of 2,500 ft. Fig. 1, flower-head ($\times 4$); 2, section of receptacle ($\times 4$); 3, outer or female floret ($\times 6$); 4, inner or hermaphrodite floret ($\times 6$); 5, pappus-hair ($\times 10$); 6, anthers ($\times 10$); 7, style-branches ($\times 10$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

SENECIO LYALLII, Hook. f.

PLATE 111. —*SENECIO LYALLII*, var. *SCORZONERIOIDES*.

FAMILY COMPOSITÆ.]

[GENUS *SENECIO*, LINN.

Senecio Lyallii, Hook. f. var. *scorzonerioides*, T. Kirk, *Students' Fl.* 340; *Cheesem. Man. N.Z.* Fl. 372.

Senecio (?) *scorzonerioides*, Hook. f. *Fl. Nov. Zel.* i. 146.

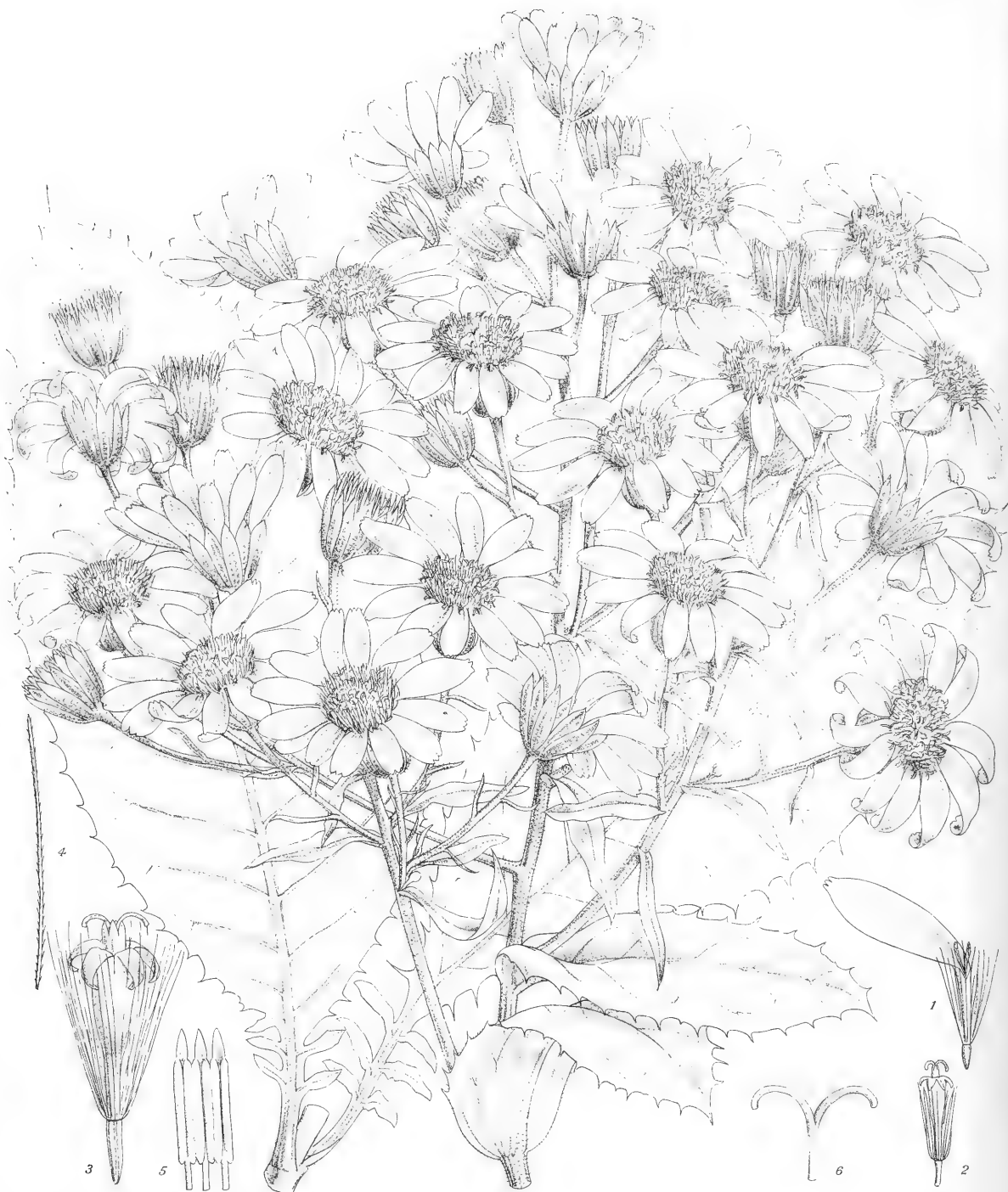
It would be difficult to select from the thirty-one or thirty-two species of *Senecio* found in New Zealand a more beautiful and charming plant than the subject of this plate. Any botanist who has penetrated into the innermost recesses of the Southern Alps, and has ascended to the open slopes, more or less clothed with subalpine vegetation, that are met with at an elevation of about 3,000 ft., cannot have failed to make its acquaintance. In many localities every little watercourse and patch of moist ground is fringed with it; the shining green leaves and broad corymbs of flower-heads, varying in colour from pure white to pale salmon, rendering it conspicuous from afar. And when it is associated, as is often the case, with other striking and noble plants, such as *Ranunculus Lyallii*, *Ligusticum Haastii*, *Celmisia coriacea*, *Veronica macrantha*, and *Ourisia macrocarpa*, the mountain-slopes become veritable gardens of floral beauty, not easily matched elsewhere, and when once seen not readily forgotten.

As the name indicates, *Senecio Lyallii* was originally discovered by Dr. Lyall, the surgeon-naturalist on H.M.S. "Acheron," which, under the command of Captain Stokes, was engaged from 1847 to 1851 in the survey of the coast-line of New Zealand. The var. *scorzonerioides*, which I have selected for illustration, was collected in Dusky Bay, and was first treated by Sir J. D. Hooker as a separate species; the typical form was obtained in Milford Sound. The two plants are evidently close allies; but the variety is readily distinguished by the broader and shorter leaves, much larger heads, and by the ray-florets being white or salmon, whereas they are yellow in the type. Many botanists will rank the two plants as distinct species.

The two forms of *S. Lyallii* have a very similar distribution, with the exception that var. *scorzonerioides* ascends to a much greater height on the mountains. Their northern limit, so far as I am aware, is on the mountains flanking the Wairau Valley, on the eastern side of the Nelson Provincial District, and the Mount Owen Range on the west. From these two localities the species ranges southwards through the mountain districts of Canterbury and Otago to Foveaux Strait and Stewart Island; but is apparently most plentiful in the central and western portions of the Alps, or, in other words, within the influence of the western rainfall. Var. *scorzonerioides* ascends to over 6,000 ft. on the mountains of Nelson and Canterbury; the typical form descends to sea-level in Stewart Island.

S. Lyallii, taking it in the wide sense, is a very distinct species. It is not closely allied to any other New Zealand plant; nor do I know any Australian or South American species to which it could be compared. Unfortunately, it is not often seen in cultivation; but if grown in a suitable rock garden, with a little shade, and with abundant moisture and perfect drainage, there seems to be no reason why it should not succeed.

PLATE 111. *Senecio Lyallii*, var. *scorzonerioides*, drawn from specimens collected in the Hooker Valley, Mount Cook district, at an altitude of 4,000 ft. Fig. 1, involucre bract, showing the glandular pubescence ($\times 4$); 2, lower portion of ray-floret ($\times 6$); 3, pappus-hair ($\times 12$); 4, disc-floret ($\times 6$); 5, anthers ($\times 10$); 6, style-branches ($\times 10$).



M. Smith del.
J. N. Fitch lith.

SENECIO HECTORI, Buch.

West, Newman imp.

PLATE 112.—SENECIO HECTORI.

FAMILY COMPOSITÆ.]

[GENUS SENECIO, LINN.]

Senecio Hectori, Buch. in *Trans. N.Z. Inst.* v (1873), 348; *Cheesem. Man. N.Z. Fl.* 376.

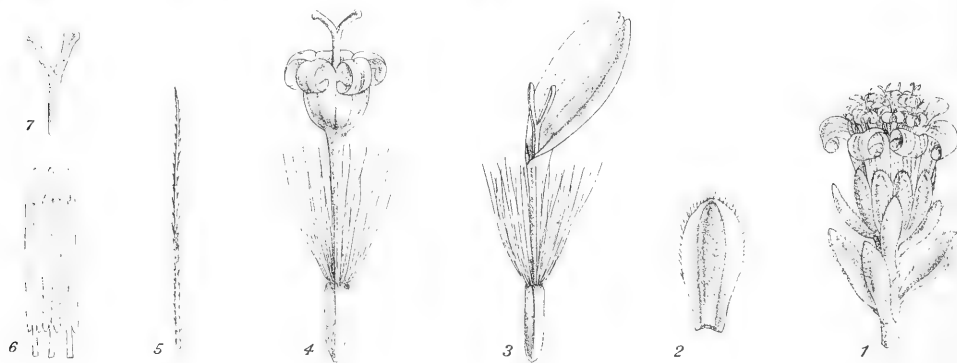
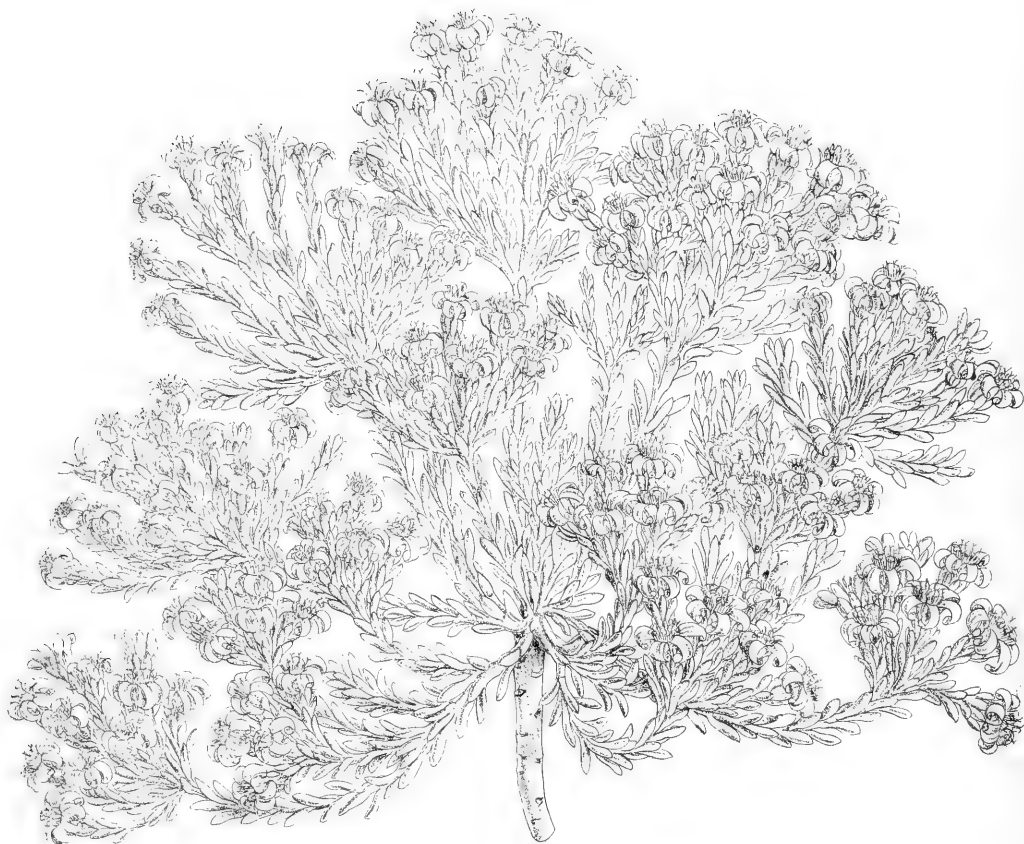
The previous plate represents the finest herbaceous *Senecio* found in New Zealand; in the present one an equally handsome shrubby species is delineated. It has been worthily associated with the name of Sir James Hector, the first Director of the Geological Survey and Manager of the New Zealand Institute, who for a period of forty years was the leader of scientific thought and activity in the Dominion, and the promoter of every inquiry into its natural history.

S. Hectori was originally discovered by Mr. W. T. L. Travers near Collingwood and in the Wangapeka Valley, but from some unexplained reason was not published. In January, 1872, however, Sir James Hector collected it in several localities in the Buller Valley, finding it particularly plentiful in the dense shrubberies fringing the banks of the river between the junction of its tributary streams the Mangles and Inangahua; and a description of the species was supplied by Mr. Buchanan to the next volume of the "Transactions of the New Zealand Institute." Later on it was observed by Mr. McGregor near Lake Rotoiti; by Mr. T. Kirk between Takaka and Riwaka; and by myself near the source of the Takaka River, and along the valley of the Upper Motueka and its tributaries. It has also been gathered by Mr. Townson in the valley of the Fox, between the Paparoa Range and the sea, the most western locality I am acquainted with. The species is thus a plant of north-west Nelson, and is confined to humid inland valleys from Collingwood southwards to the Grey River; its altitudinal range being from 200 ft. to a little above 3,000 ft.

S. Hectori is a most distinct species, not closely allied to any other. Its nearest relative is probably the equally handsome *S. Kirkii*, which has a very similar inflorescence, and the ligules of the ray-florets are white in both species. But the habit of the two plants is altogether different. *S. Kirkii* is perfectly smooth and glabrous, with almost fleshy leaves, whereas *S. Hectori* is more or less tomentose, and the leaves are thin and membranous. Again, *S. Hectori* has the remarkable character of the leaves being pinnate or pinnatifid for a short distance at the very base, all the rest of the leaf being acutely toothed, whereas in *S. Kirkii* the leaves are either quite entire or sinuate-dentate above the middle only.

The limited geographical distribution of many species of *Senecio* has often been commented upon, and excellent examples are afforded by the shrubby species found in New Zealand. Thus the subject of this plate is confined to a narrow strip of north-west Nelson. *S. myrianthos* is only known from a few wooded ravines in the Cape Colville Peninsula. *S. perdicoides* is strictly limited to the East Cape district. *S. Huntii* has never been found except in the Chatham Islands; while its near ally *S. Stewartii* exists only on the Snares, the Solanders, and the little Herekopere Island, in Foveaux Strait. *S. Greyii* and *S. compactus* are confined to a small portion of the east coast of the Wellington Provincial District. *S. revolutus* is only known from the extreme south-west of Otago; while the remarkable *S. bifistulosus* has never been gathered save in Dusky Sound. No other genus found in New Zealand can show such a number of conspicuous species with such narrow geographical ranges.

PLATE 112. *Senecio Hectori*, drawn from specimens collected by the Graham River, north-west Nelson. Fig. 1, ray-floret ($\times 2$); 2, disc-floret ($\times 2$); 3, disc-floret ($\times 4$); 4, pappus-hair ($\times 8$); 5, anthers ($\times 6$); 6, style-branches ($\times 8$).



M. Smith del.
J. N. Fitch lith

West, Newman imp.

SENECIO CASSINOIDES, Hook. f.

PLATE 113.—SENECIO CASSINOIDES.

FAMILY COMPOSITÆ.]

[GENUS SENECIO, LINN.

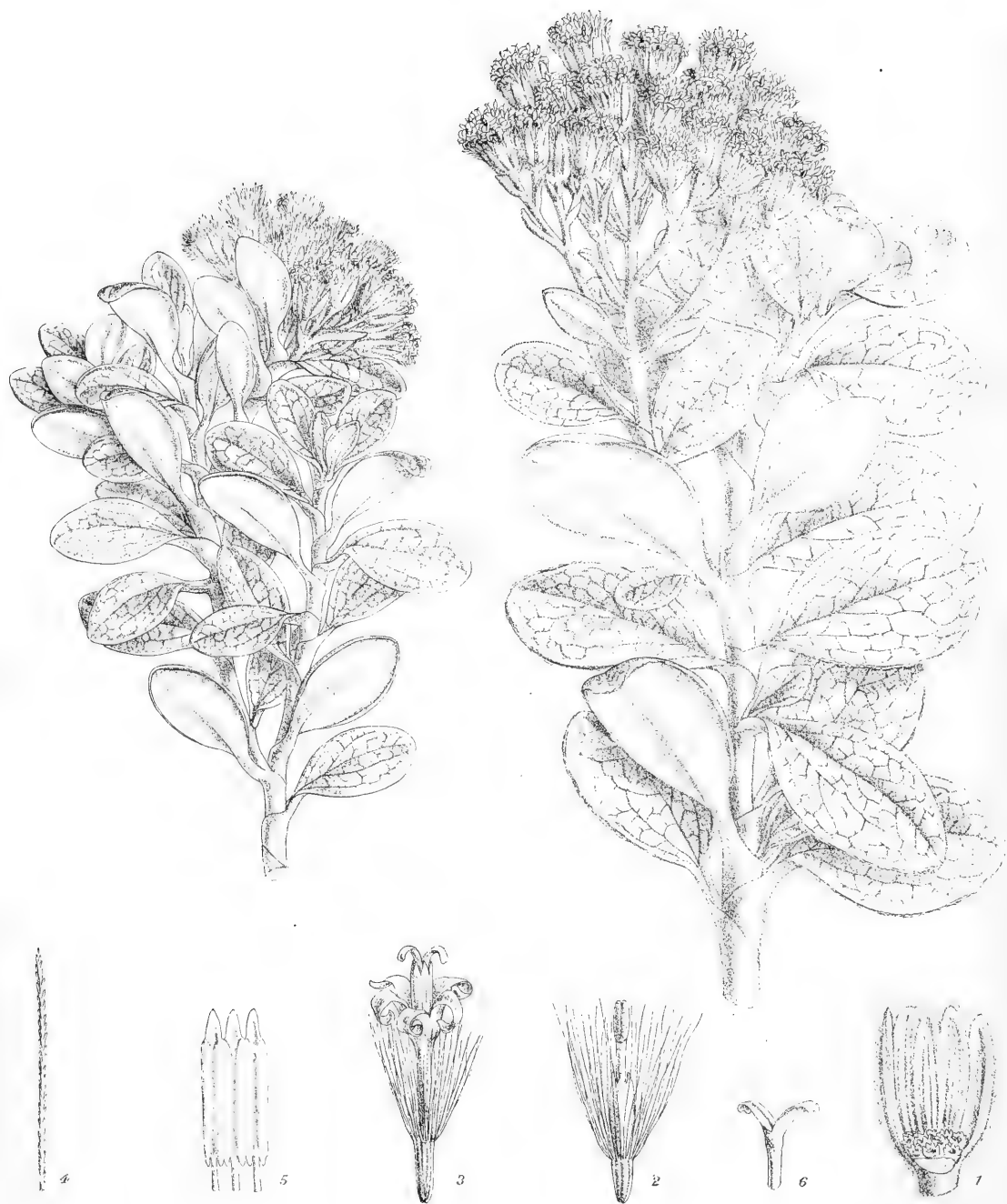
Senecio cassinioides, Hook. f. *Handb. N.Z. Fl.* 163; *Cheesem. Man. N.Z. Fl.* 382.

A good illustration of the wide range of characters which separate the shrubby species of *Senecio* found in New Zealand is afforded by the two species figured in this plate and the previous one. Size, habit, foliage, indumentum, inflorescence, and colour of the flowers are totally different in the two plants, yet both are undoubted species of the genus.

S. cassinioides was originally discovered by Dr. Sinclair at the Wairau Gorge, Nelson, in the year 1860. In the following summer he again gathered it in the Rangitata Valley, the district where, only a short time later, he lost his life in an imprudent attempt to ford the Rangitata River. During the next few years it was observed by Sir Julius von Haast in several localities on the eastern flanks of the Southern Alps, by Mr. Buchanan in Marlborough and in the Lake district of Otago, and by Mr. Petrie in the valleys of north and north-western Otago. More recently it has been collected in numerous intermediate localities, while its southern range has been considerably advanced through its discovery on Mount Franklin, Southland, by Mr. Crosby-Smith. So far as I am aware, however, it has never been collected on the western side of the South Island.

My own acquaintance with *S. cassinioides* dates back to 1878, when I observed it in the Upper Wairau Valley, not far from Travers's original locality. I have also seen it in the Upper Clarence Valley, and near Lake Tennyson; on terraces by the Broken River and elsewhere in the Upper Waimakariri; near Lake Tekapo; and in several localities in the Mount Cook district. Its altitudinal range appears to be from 2,000 ft. to 4,000 ft. Usually it forms a broad closely branched round-topped bush 4 ft. to 10 ft. high, and from its pale greenish-grey colour is readily picked out from the subalpine scrub with which it is commonly associated. Small specimens have a general resemblance to *Cassinia Vauvilliersii*, but the loose papery bark, more numerous branchlets, softer tomentum, and bright-yellow flowers distinguish it at a glance.

PLATE 113. *Senecio cassinioides*, drawn from specimens collected on terraces by the Broken River, Canterbury Alps, at an altitude of 2,500 ft. Fig. 1, tip of branchlet, showing leaves and a flower-head ($\times 2$); 2, involucre bract ($\times 4$); 3, ray-floret ($\times 6$); 4, disc-floret ($\times 6$); 5, pappus-hair ($\times 12$); 6, anthers ($\times 12$); 7, style-branches ($\times 12$).



M. Smith del
J. N. Fitch lith

West, Newman imp.

SENECIO BIDWILLII, Hook f.

PLATE 114.—SENECIO BIDWILLII.

FAMILY COMPOSITÆ.]

[GENUS SENECIO, LINN.

Senecio Bidwillii, Hook. f. *Fl. Nov. Zcl.* i, 150; *Chcsem. Man. N.Z. Fl.* 383.

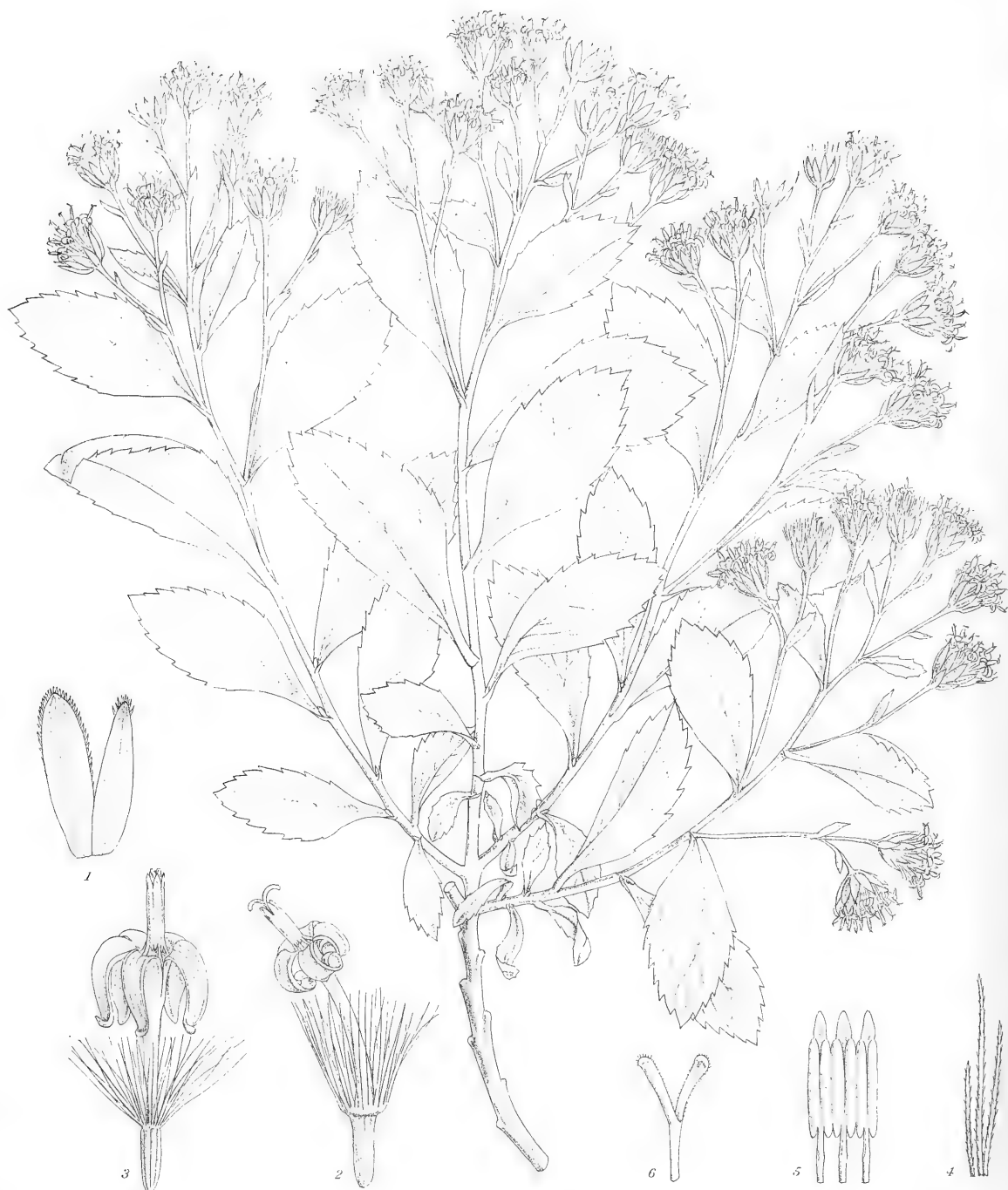
Senecio Bidwillii commemorates the name of Mr. J. T. Bidwill, who in the years 1839 and 1842 made two visits to New Zealand for the purpose of studying its vegetation, and who was the first European to ascend Ngauruhoe and to examine the flora of the volcanic plateau on which it stands. He was the discoverer of several most interesting plants, as *Veronica tetragona*, *Dracophyllum recurvum*, *Dacrydium laxifolium*, and the subject of the present plate. His collections, made at a time when botanists were altogether ignorant of the mountain-flora of New Zealand, naturally attracted considerable attention.

The next botanist to observe *S. Bidwillii* was Mr. Colenso, who in 1845 ascended the Ruahine Range, and in 1847 travelled from Taupo along the eastern flanks of Tongariro, Ngauruhoe, and Ruapehu, returning to Napier across the Ruahine Range. In all these localities he found the plant to be abundant; and he also gathered it on the summit of Mount Hikurangi, in the East Cape district, which appears to be its northern limit. Subsequent collectors all agree in stating that it is an abundant subalpine plant on the higher mountain-ranges of the North Island as far south as Mount Hector, at the southern end of the Tararua Range. In the South Island a slightly different variety, with a somewhat taller and more slender habit, rather larger and narrower and less coriaceous leaves, and broader corymbs, is not uncommon on the mountains of Nelson, Marlborough, Westland, and Canterbury as far south as the Rangitata Valley. The altitudinal range of the species can be given as from 2,500 ft. to 5,000 ft.

Senecio Bidwillii is one of the chief components of the subalpine "scrub" on the slopes of Ruapehu, Ngauruhoe, and Tongariro. It is usually associated with *Dracophyllum recurvum* and *D. subulatum*, *Epacris alpina*, *Veronica tetragona*, *Pimelea buxifolia*, *Olearia nummularifolia*, *Dacrydium Bidwillii*, and *Phyllocladus alpinus*. It generally forms a stout much branched shrub from 2 ft. to 5 ft. in height, the branches being often gnarled and twisted, and usually bare of leaves except towards the tips. The leaves are excessively thick and coriaceous, and while pretty constant in outline, vary much in size; specimens growing in very dry or exposed situations having leaves barely more than $\frac{1}{2}$ in. in length, while in sheltered localities they may be quite 2 in. The heads are about $\frac{1}{3}$ in. in diameter, devoid of rays, pale yellowish-green, and conspicuously sweet-scented.

The nearest ally to *S. Bidwillii* is no doubt *S. elaeagnifolius*, which agrees in the structure of the flower-heads and other characters, but which is easily separated by the larger size and more open habit, much larger and narrower leaves, and larger panicles.

PLATE 114. *Senecio Bidwillii*, drawn from specimens collected near the base of Ruapehu, at an altitude of 3,500 ft. Fig. 1, longitudinal section through involucre and receptacle ($\times 3$); 2, female floret ($\times 4$); 3, hermaphrodite floret ($\times 4$); 4, pappus-hair ($\times 12$); 5, anthers ($\times 8$); 6, style-branches ($\times 8$).



M. Smith del.
J. N. Fitch lith.

West, Newman imp.

SENECIO GEMINATUS, T. Kirk.

PLATE 115.—SENECIO GEMINATUS.

FAMILY COMPOSITÆ.]

[GENUS SENECIO, LINN.]

Senecio geminatus, T. Kirk, *Students' Fl.* 350; *Cheesem. Man. N.Z. Fl.* 384.

Traversia baccharoides, Hook. f. *Handb. N.Z. Fl.* 164.

The first specimens of this very distinct plant were obtained by Dr. Sinclair in the year 1860 in the Upper Awatere and Wairau Valleys. A few years later it was collected by Mr. W. T. L. Travers on the Discovery Peaks, in the Upper Waiau Valley, and on the Hurunui Mountains in northern Canterbury. In 1865 it was gathered by Sir Julius von Haast in the Upper Waimakariri, while in 1881 it was found by myself on the Mount Arthur Range. The species thus ranges from north-west Nelson to the middle of the Canterbury Alps, and of late years specimens have been obtained from many localities between these points. It is apparently common on many of the mountains of Marlborough. On Mount Mouatt, according to Mr. Buchanan, it descends to 2,000 ft., and I believe that Mr. Kirk traced it to an even lower altitude on Mount Fyffe. On the western side of the watershed of the South Island I only know of it from Lake Rotoiti, and the Upper Buller Valley, where it descends to 1,500 ft. It was not observed by Mr. Townson in his exploration of the Westport district. I have not myself seen it at a higher elevation than 4,500 ft., but Hooker quotes 5,500 ft. in the "Handbook," on the authority of Mr. Travers.

S. geminatus is a very isolated species, with no near allies. It differs from *Senecio*, as Sir J. D. Hooker has observed, in the rigid pappus and coriaceous involucreal scales. The leaves are of a very similar type to those of the American genus *Baccharis*; and their venation, according to Hooker, "recalls that of the Juan Fernandez genera *Balbisia* and *Robinsonia*." These characters induced Hooker to describe it as the type of a new genus under the name of *Traversia baccharoides*; but in the "Genera Plantarum" Bentham and Hooker concurred in reducing *Traversia* to *Senecio*. In the "Students' Flora" Mr. Kirk therefore replaced it in the genus, giving it the new specific name of *geminatus*, on the ground that the term *baccharoides* was already preoccupied by a South American plant (*Senecio baccharoides*, H. B. K.), and I adopted the same course in the Manual. Further inquiry, however, has led me to doubt whether Mr. Kirk's action can be justified, for many years ago the American *S. baccharoides* was transferred to the genus *Gymozys*, leaving the specific name open to use. In 1897 this was recognized by Hoffman in "Die Natürlichen Pflanzenfamilien" (teil iv, abt. 5, p. 299), and Hooker's specific name adopted.

So far as my own observations go, *S. geminatus* forms a small spreading shrub, seldom more than 4 ft. or 5 ft. in height, and often less. The young branchlets, leaves, and involucreal scales are more or less glutinous, not a common character in *Senecio*, but one more or less general in *Baccharis*.

PLATE 115. *Senecio geminatus*, drawn from specimens collected by Mr. F. G. Gibbs on Mount Owen, Nelson, at an altitude of 3,000 ft. Fig. 1, involucreal bracts ($\times 6$); 2, floret, showing the tubular corolla with revolute lobes ($\times 6$); 3, the same with the corolla-lobes spread out ($\times 6$); 4, pappus-hairs ($\times 12$); 5, anthers ($\times 15$); 6, style-branches ($\times 12$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

SONCHUS GRANDIFOLIUS, T. Kirk.

PLATE 116.—*SONCHUS GRANDIFOLIUS*.

FAMILY COMPOSITÆ.]

[GENUS *SONCHUS*, TOURN.

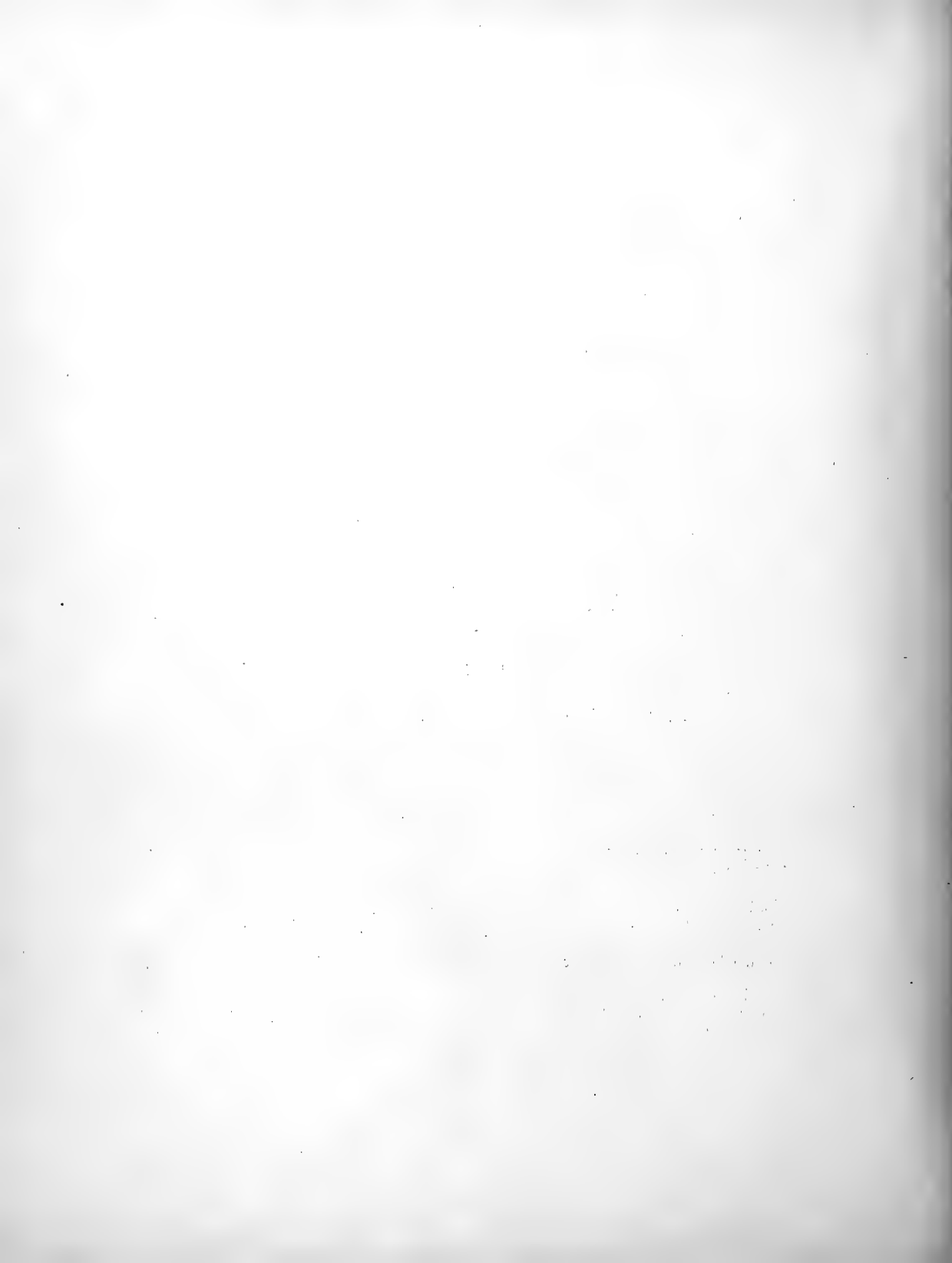
Sonchus grandifolius, T. Kirk in *Trans. N.Z. Inst.* xxvi (1894), 266; *Cheesem. Man. N.Z.* Fl. 388.

Sonchus grandifolius, which is a very curious and remarkable species, was first gathered by Mr. H. H. Travers in the year 1871 during his second visit to the Chatham Islands. His specimens, however, were few in number and in bad condition, and consequently were passed over without notice by Mr. Buchanan in his memoir on "The Flowering-plants and Ferns of the Chatham Islands" (*Trans. N.Z. Inst.* vii (1875), 333). In 1891 Mr. J. D. Enys visited the Chatham Islands, and brought back a few imperfect specimens which he gave to Mr. Kirk. From their examination, and from the study of some plants cultivated at Christchurch, Mr. Kirk was able to prepare a sufficient diagnosis of the species. Since then the plant has been repeatedly collected by Mr. Cox, and was studied in detail in Dr. Cockayne's exploration of the group in 1901.

I have never had an opportunity of visiting the Chatham Islands, but I am familiar with the appearance and behaviour of the plant in cultivation. It possesses a stout succulent creeping rhizome, which every spring puts up a tall robust leafy stem from 2 ft. to 5 ft. high. The radical leaves are of large size, sometimes quite 2 ft. in length, and are closely applied to the ground. The stem is corymbosely branched at the top, and bears numerous heads 1 in. to 1½ in. in diameter. The florets in the centre of the heads are pale yellow, but those towards the outside are pale purple.

Nowadays *S. grandifolius* is far from common. Dr. Cockayne, in his "Plant Covering of Chatham Islands" (*Trans. N.Z. Inst.* xxxiv (1902), 263), states "that at present it is to be found only in a few places." Further on, speaking of terraces and ledges on maritime rocks on which sand has drifted, he remarks that at Red Bluff, situated on the west coast of Chatham Islands, "*Sonchus grandifolius* grows with great luxuriance just above high-water mark, its large fleshy leaves pressed closely against the sand. The plant is truly a herbaceous one, its aerial portion dying down to the ground every year. . . . Growing in company with *S. grandifolius*, and in considerable quantities, are *Apium australe*, *Samolus repens*, *Salicornia australis*, and the remarkable grass *Agropyrum Coxii*." Dr. Cockayne considers, however, that *S. grandifolius* once had a much wider distribution, and was probably not uncommon on the consolidated sand-dunes which cover large areas on the shores of Chatham Islands. Its present restricted distribution is no doubt due to the introduction of cattle, and to the numerous fires.

PLATE 116. *Sonchus grandifolius*, drawn from cultivated specimens originally from the Chatham Islands. Figs. 1 to 5, involucre bracts, showing the difference in size and shape between the exterior and interior ($\times 2$); 6 and 7, florets ($\times 2$); 8, pappus-hairs ($\times 10$); 9, anthers ($\times 5$); 10, style-branches (enlarged); 11, achene (enlarged).





M. Smith del.
J. N. Fitch lith.

West, Newman imp.

FORSTERA TENELLA, Hook. f.

PLATE 117.—FORSTERA TENELLA.

FAMILY STYLIDIACEÆ.]

[GENUS FORSTERA, LINN. F.]

Forstera tenella, Hook. f. *Fl. Nov. Zel.* i, 155; *Cheesem. Man. N.Z. Fl.* 393.

The genus *Forstera* was selected by the younger Linnaeus to commemorate the botanical labours of J. R. Forster and his son J. G. Forster, who both accompanied Cook during his second voyage, and who made large botanical collections in New Zealand, South America, and Polynesia. They also published in their works "Characteres Generum Plantarum Maris Australis" and "Prodromus Florulæ Insularum Australium" the first descriptions of New Zealand and Polynesian plants, and their names must therefore be inseparably connected with the history of the botany of those countries.

Forstera tenella was first collected by Dr. Lyall in Milford Sound, and also in some locality in Otago, and was published by Sir J. D. Hooker in the "Flora Novæ Zelandiæ" in 1853. Sir Julius von Haast gathered it during his explorations in the Southern Alps, and it has since been observed in many localities in the central and western portions of the South Island, from Collingwood to Preservation Inlet. It has also been recorded from several localities in the North Island to the south of the Ruahine Mountains; but I have not myself seen specimens from thence. Its altitudinal range, as observed by myself, is from 1,500 ft. to 4,500 ft., but I suspect that it descends to lower elevations in the river-valleys of Westland and in the Sounds of the south-west coast of Otago.

The three species of *Forstera* found in New Zealand are very closely allied. *F. sedifolia* is best separated by the densely imbricated recurved leaves, which on their under-surface have a conspicuous median nerve. *F. Bidwillii* and the subject of this plate are very near to one another, and are often confused. *F. Bidwillii*, however, is much more copiously branched and usually decumbent or almost creeping at the base. The leaves are more closely placed, broader, and more obovate; and the median nerve, though indistinct, is usually present. *F. tenella* is sparingly branched or quite simple, and usually erect. The leaves are narrower, sometimes almost acute, and generally narrowed into a short petiole, while the median nerve is obsolete.

PLATE 117. *Forstera tenella*, drawn from specimens gathered in the Otira Valley, Westland, at an altitude of 2,000 ft. Fig. 1, pair of flowers ($\times 3$); 2, portion of corolla, showing the pair of glands at the base of the lobes ($\times 5$); 3, summit of column, showing the transverse anthers ($\times 8$); 4, the same with the anthers bent downwards, so as to expose the two lobes of the immature stigma ($\times 8$); 5, flower with the calyx and corolla removed, showing the two staminodia, and the two lobes of the stigma in their mature condition ($\times 8$); 6, transverse section of ovary ($\times 8$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

SCAEVOLA GRACILIS, Hook. f.

PLATE 118.—SCÆVOLA GRACILIS.

FAMILY GOODENIACEÆ.]

[GENUS SCÆVOLA, LINN.

Scævola gracilis, Hook. f. in Journ. Linn. Soc. i (1857), 129; Cheesem. Man. N.Z. Fl. 395.

Distant over six hundred miles from New Zealand, and surrounded by an immensely deep ocean, lie the Kermadec Islands, a chain of four widely separated islands stretching in a south-west to north-east direction. All are of small size; the largest, known by the name of Sunday Island, being under seven miles in length by less than five in breadth. Their situation, rather more than half-way between New Zealand and the Tongan Islands, gives special importance to them in any inquiries respecting the origin of the New Zealand flora, and I am pleased to be able to figure three or four of their endemic plants in this work.

Scævola gracilis, the subject of this plate, was first collected on Sunday Island by Messrs. Milne and McGillivray, of H.M.S. "Herald," which, under the command of Captain Denham, visited the group in 1854. In August, 1887, I accompanied an expedition to the Kermadec Islands for the purpose of annexing the group to the Colony of New Zealand, and formed a tolerably complete collection of its flora, finding *S. gracilis* fairly plentiful in rocky places both on Sunday Island and Macaulay Island. It was also gathered on Sunday Island by Miss Shakespear in 1904; and in 1907 by Mr. R. B. Oliver, who made a stay of nine months on the island investigating its fauna and flora.

S. gracilis forms a procumbent undershrub from 2 ft. to 3 ft. or even 4 ft. high, with long straggling branches more or less densely clothed with silky hairs. The flowers are small, white with a yellow centre, sweet-scented, and are produced abundantly throughout the year. The fruit is white, succulent, about $\frac{1}{3}$ in. long. Although usually found in rocky places, both on seaciffs and inland, it is by no means confined to such. Mr. Oliver, in his paper on "The Vegetation of the Kermadec Islands" (Trans. N.Z. Inst. xlii (1909), 172), records it, in addition, on sand-dunes, gravel-flats, land-slips, &c. So far it has not found its way into cultivation, but it would probably do well anywhere in the northern part of the North Island, and from its free-flowering habit might prove a welcome addition to our gardens.

PLATE 118. *Scævola gracilis*, drawn from specimens collected on the Kermadec Islands. Fig. 1, flower with the corolla removed ($\times 4$); 2, corolla laid open, showing the glandular hairs on the inside of the tube ($\times 3$); 3, two of the glandular hairs ($\times 15$); 4 and 5, front and back view of anthers ($\times 8$); 6, longitudinal section of ovary ($\times 5$); 7, indusium, with one side cut away, showing the 2-lobed stigma ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

PRATIA PHYSALOIDES, Hemsl.

PLATE 119.—PRATIA PHYSALOIDES.

FAMILY CAMPANULACEÆ.]

[GENUS PRATIA, GAUD.]

Pratia physaloides, Hemsl. *Ic. Plant.* sub. t. 1532.

Colensoa physaloides, Hook. f. *Fl. Nov. Zel.* i, 157; *Cheesem. Man. N.Z. Fl.* 397.

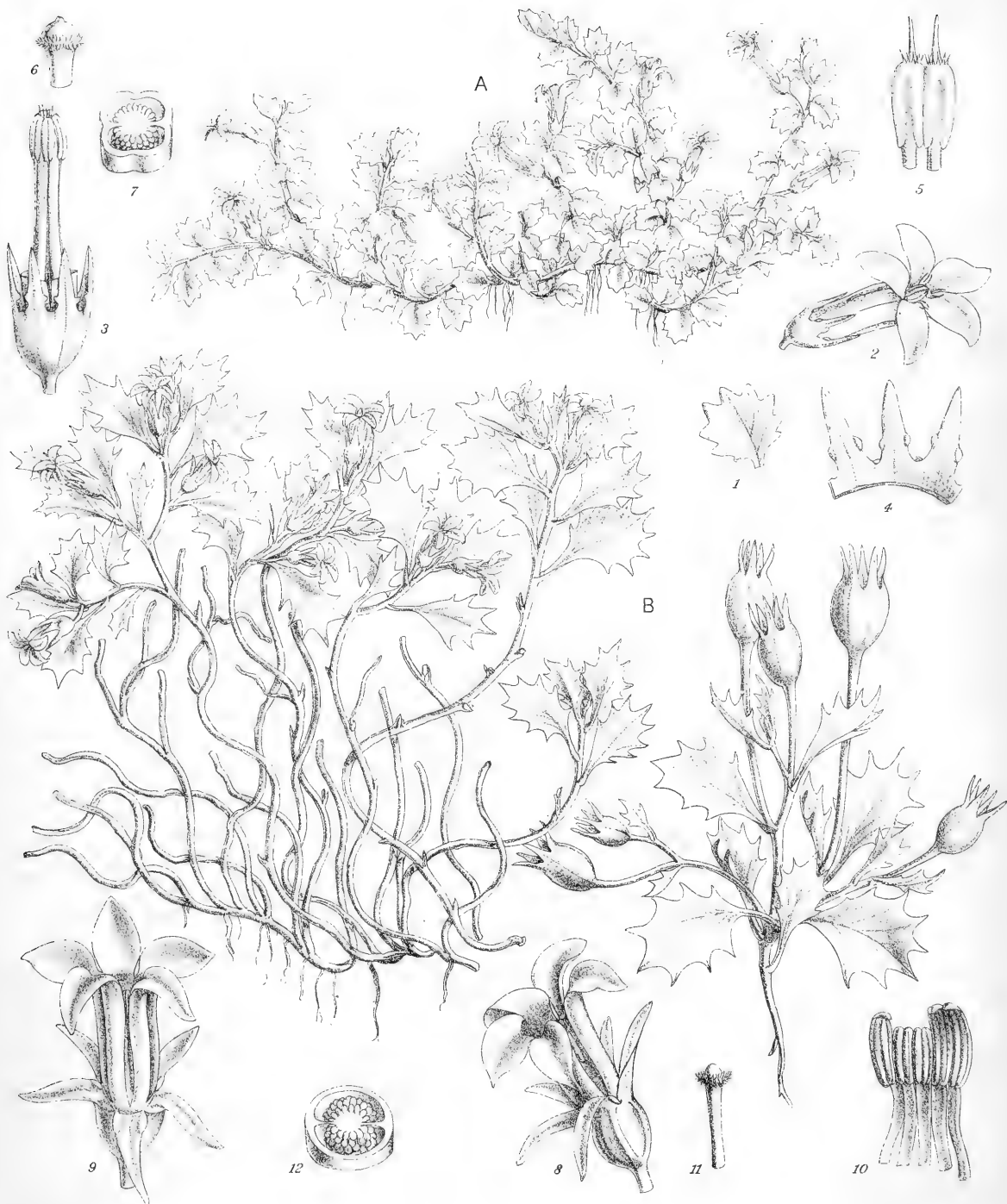
This fine plant was one of the many discoveries made by Richard Cunningham, who visited New Zealand in the years 1833-34, and who collected it at Whangaroa, Mātāuri Bay, and in some stations in the Bay of Islands. His brother Allan, who made a similar journey in 1824, and who was the author of the well-known "*Floræ Insularum Novæ Zelandiæ Precursor*," described the plant under the name of *Lobelia physaloides*, and Sir W. J. Hooker figured it under the same title in the "*Icones Plantarum*" (tt. 555-56). Mr. Colenso, who arrived in New Zealand at the close of 1834, shortly made the acquaintance of our plant; and it was also gathered by Dr. Dieffenbach in the North Cape district in 1839. From that time it has been observed by many botanists in the northern portion of the Auckland Provincial District, although it must be looked upon as a somewhat rare and local species.

The discovery that the fruit is succulent at once proved that the plant could not be retained in *Lobelia*, all the species of which have capsular fruit. In the "*Flora Novæ Zelandiæ*" Sir J. D. Hooker therefore proposed the genus *Colensoa* for its reception. More recent investigations, however, have shown that the genus is hardly satisfactory. Hooker himself has drawn attention to its close relationship to *Pratia*, which only differs "in the usually small size and creeping habit of the species, their more equal corolla-lobes, and solitary flowers, and in some or all the anthers being strongly bearded or terminated by bristles. In other respects *Colensoa* is a gigantic *Pratia*" (Bot. Mag. sub. t. 6864). In the same year (1886) that the above was published Mr. Hemsley, with the approval of Sir J. D. Hooker, reduced *Colensoa* to *Pratia* (*Ic. Plant.* sub. t. 1532); and Schonland, in "*Die Naturlichen Pflanzenfamilien*," has followed a similar course. Under these circumstances, the accompanying plate appears under the name of *Pratia physaloides*.

I greatly regret to see the name of *Colensoa* disappear from the list of the genera of New Zealand plants, and feel sure that all those will agree with me who are acquainted with the history of New Zealand botany during the long period—1834 to 1899—when Mr. Colenso was an active worker, not only in the botany of his adopted country, but in many other branches of science. I cannot resist quoting the appreciation of his work published by Sir J. D. Hooker in 1886, when, speaking of *Colensoa*, he says, "The name it bears is that of one who well deserves the name of the patriarch of living New Zealand naturalists, the friend of Allan Cunningham, who botanized the northern Island in 1838; the companion of Darwin in some of his rambles about the Bay of Islands in 1835; and the zealous aider of the naturalists of the Antarctic expedition in 1841. Of him it is written in the preface to the '*Handbook of the New Zealand Flora*' that during many successive years he has collected throughout the whole length of the northern Island with great care and skill, discovering more rare and new plants than any botanists since Banks and Solander, and that in every respect Mr. Colenso is the foremost New Zealand botanical explorer, and the one to whom the author of the flora of that country is the most indebted for specimens and observations."

Pratia physaloides is a handsome plant, and is certainly worth wider cultivation than is the case at present, especially as it succeeds well in any ordinary garden-soil. When well grown its slender graceful habit, bold foliage, and numerous oddly shaped pale-blue flowers present a decidedly attractive appearance.

PLATE 119. *Pratia physaloides*, drawn from specimens collected in Spirits Bay, in the North Cape Peninsula. Fig. 1, flower, with the corolla removed ($\times 2$); 2, anthers ($\times 3$); 3, transverse section of ovary ($\times 2$).



M. Smith del.
J.N. Fitch lith.

West, Newman imp.

A. *PRATIA MACRODON*, Hook. f. 1-7.
B. *LOBELIA ROUGHII*, Hook. f. 8-12.

PLATE 120. PRATIA MACRODON AND LOBELIA ROUGHII.

FAMILY CAMPANULACEÆ.]

[GENERA PRATIA, GAUD.
LOBELIA, LINN.

Pratia macrodon, Hook. f. *Handb. N.Z. Fl.* 172; *Cheesem. Man. N.Z. Fl.* 398.

Lobelia Roughii, Hook. f. *Handb. N.Z. Fl.* 171; *Cheesem. Man. N.Z. Fl.* 400.

Pratia macrodon was discovered at about the same time by Mr. W. T. L. Travers on the mountains flanking the Upper Wairau, Clarence, and Waiau Valleys; and on Mount Torlesse by Sir Julius von Haast. Subsequent observers have since found it in many localities on both the eastern and western sides of the central watershed of the South Island, from the Dun Mountain Range to the south-west of Otago. Its altitudinal range is from 3,000 ft. to 5,500 ft.

The usual station for *Pratia macrodon* is on open mountain-slopes formed of fragments of rock mixed with a sandy or clayey soil, and thus presenting a consolidated surface sparsely clothed with subalpine plants. An old shingle-slope, partially or altogether fixed, frequently has colonies of *P. macrodon* on its margins, where there has been no movement of the stones for some years at least. The creeping and rooting stems are copiously branched, and form matted patches 2 in. to 4 in. in diameter or more. The leaves are thick and coriaceous, and are coarsely dentate. The axillary and solitary flowers are large for the size of the plant, $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long, pale yellow, and very sweet-scented; while the berry is about $\frac{1}{3}$ in. in diameter. As a species it is very distinct from any other known to me.

Lobelia Roughii is one of the plants first collected by Captain D. Rough, who gathered it on Dun Mountain, Nelson, about the year 1858. Shortly afterwards it was observed by Mr. W. T. L. Travers on shingle-slopes above the Wairau Gorge, and in similar situations on the mountains flanking the Waiau Valley. Further research has shown that it has a wide range on the shingle-slopes of the eastern side of the watershed of the South Island, but it seldom occurs in large quantity. I have gathered it on the mountains flanking the Wairau Valley, on Mount Torlesse, and on the mountains at the head of the Broken River, also on Mount Dobson. Mr. Armstrong collected it in the Rangitata Valley, while Mr. Petrie has recorded it from several localities in Central Otago. Its altitudinal range may be given at from 3,000 ft. to 6,000 ft.

L. Roughii is a most distinct species, and I am not aware that it is closely allied to any other. When bruised or broken it everywhere exudes a milky and acrid fluid. Whether this juice is poisonous, as is the case in some other species of the genus, I am unable to say; in fact, I do not think it has ever been chemically examined. The flower is remarkable on account of the two dorsal petals being free from one another to the base, so that the corolla could be described as three-lipped. Like many other shingle-plants, the creeping stem and the lower part of the numerous branches are covered by the angular debris composing the shingle-slope, the leafy tips of the branchlets alone appearing on the surface.

PLATE 120A. *Pratia macrodon*, drawn from specimens collected by Mr. F. G. Gibbs on Mount Peel, Nelson, at an altitude of 4,500 ft. Fig. 1, leaf ($\times 2$); 2, flower ($\times 2$); 3, the same with the petals removed ($\times 3$); 4, portion of calyx spread open ($\times 3$); 5, two anterior anthers ($\times 6$); 6, stigma ($\times 6$); 7, transverse section of ovary ($\times 3$).

PLATE 120B. *Lobelia Roughii*, drawn from specimens collected on Mount Peel, Nelson, by Mr. F. G. Gibbs. Figs. 8 and 9, flower, side and back view ($\times 3$); 10, anthers ($\times 5$); 11, style and stigma ($\times 5$); 12, section of ovary ($\times 5$).



M. Smith del.
J.N. Fitch lith.

West Newman imp.

WAHLENBERGIA SAXICOLA, A. DC.

PLATE 121.—WAHLENBERGIA SAXICOLA.

FAMILY CAMPANULACEÆ.]

[GENUS WAHLENBERGIA, SCHRAD.

Wahlenbergia saxicola, A. D.C. *Monog. Camp.* 144; *Hook f. Fl. Nov. Zel.* i, 160; *Cheesem. Man. N.Z. Fl.* 402.

Wahlenbergia saxicola was originally discovered by the illustrious botanist Robert Brown on the summit of Mount Wellington, Tasmania, in the year 1804. At what time it was first gathered in New Zealand is a little uncertain, the earliest record that I can find dating back no further than 1839, when it was collected on Tongariro by Mr. J. C. Bidwill, who in 1844 also observed it near Nelson. Mr. Colenso apparently did not gather it until his first journey to the Ruahine Range in 1845. Considering how common the plant is in the South Island it is somewhat curious that Banks and Solander did not observe it in Queen Charlotte Sound, and that it was not collected either by Forster in Dusky Bay or by Raoul at Akaroa. It is now known to be a common mountain-species almost anywhere to the south of a line drawn from Mount Egmont to the East Cape. In the South Island it frequently descends to sea-level, while a small blue-flowered variety ascends to a height of 6,000 ft. on the mountains of Nelson and Canterbury. It attains its southern limit at sea-level on Stewart Island.

W. saxicola is closely allied to *W. gracilis*, although the extreme forms of the two plants are very diverse. *W. saxicola*, in its best-developed state, has very short often quite simple stems, which bear a rosette of crowded spreading leaves just above the ground. From among the leaves rises a slender scape, which bears a solitary flower sometimes as much as an inch in diameter. Occasionally the rootstock is branched, or puts out creeping stolons, but these usually end in a tuft of rosulate leaves and a solitary scape, as in the first form. In small mountain states the rootstock is much branched, with the branches leafy at their tips, sometimes forming compact patches several inches in diameter. A very similar form, but much larger in all its parts, forms densely matted patches on sand-dunes near Cape Foulwind, near Westport. *W. gracilis* has slender branched stems sometimes a couple of feet in length, and the leaves are never rosulate, but scattered irregularly along the stem and its branches.

PLATE 121. *Wahlenbergia saxicola*, drawn from specimens collected in the Wairau Valley, Nelson, at an altitude of 1,800 ft. Fig. 1, longitudinal section of flower ($\times 3$); 2, stamen, showing the dilated base of the filament ($\times 5$); 3, two-lobed stigma ($\times 6$); 4, transverse section of ovary ($\times 5$); 5, ripe capsule ($\times 5$).

1. The first part of the paper is devoted to a general discussion of the problem of the existence of a solution of the system of equations

which is the system of equations of the theory of the motion of a particle in a magnetic field.

2. The second part of the paper is devoted to a detailed analysis of the problem of the existence of a solution of the system of equations

which is the system of equations of the theory of the motion of a particle in a magnetic field.

3. The third part of the paper is devoted to a detailed analysis of the problem of the existence of a solution of the system of equations

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4. The fourth part of the paper is devoted to a detailed analysis of the problem of the existence of a solution of the system of equations

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5. The fifth part of the paper is devoted to a detailed analysis of the problem of the existence of a solution of the system of equations



